

CHEMISTRY AND YOU

POPULAR MECHANICS

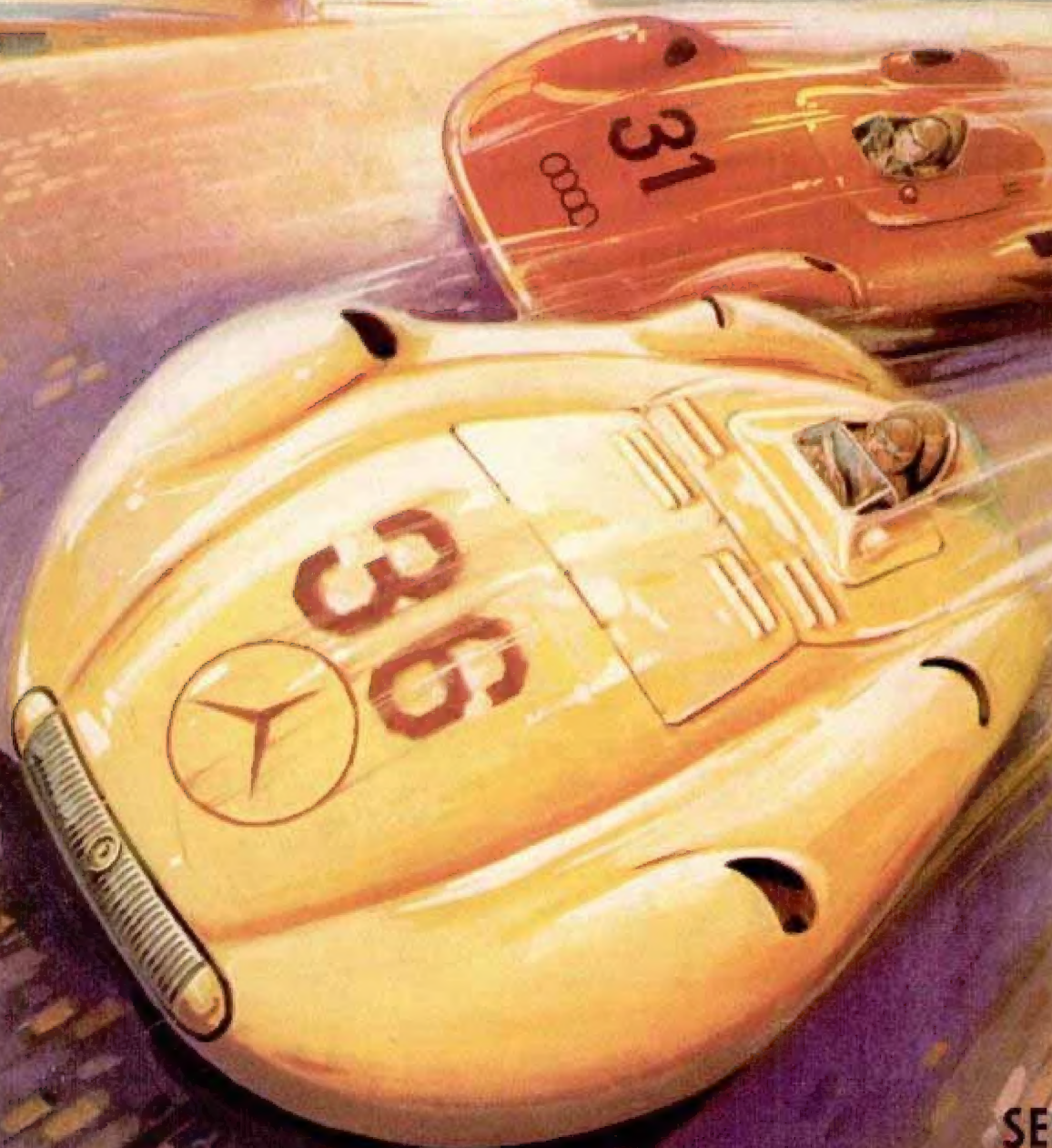
MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

REGD. TRADE MARK, GREAT BRITAIN, No. 410426

REG. U.S. PAT.-OFF.

DEC.
25 CENTS



SEE PAGE 823

... **A**UTOMOBILE MANUFACTURERS
HAVE SELECTED AS STANDARD EQUIPMENT ON
1938 MODELS ...

AUTO-LITE SPARK PLUGS

Ignition Engineered by Ignition Engineers

DE SOTO
•
PLYMOUTH
•
NASH

● Auto-Lite Spark Plugs are Standard Equipment—they are manufactured by The Electric Auto-Lite Company, who for twenty-six years have been building Starting, Lighting and Ignition Equipment for the automotive industry.

Auto-Lite Spark Plugs are built to work in harmony with the rest of the Ignition System and as a result, give you perfect motor performance. Ask your dealer to install a set of new Auto-Lite Spark Plugs in your car today.

THE ELECTRIC AUTO-LITE COMPANY
MERCHANDISING DIVISION • TOLEDO, O.



News of Plymouth's Great New 1938 Car

IT'S AN EXCITING CAR TO SEE...TO DRIVE...NEW RICHNESS OUTSIDE AND INSIDE...NEW COMFORTS AND DRIVING EASE...MORE VISION...AMAZING VALUE!

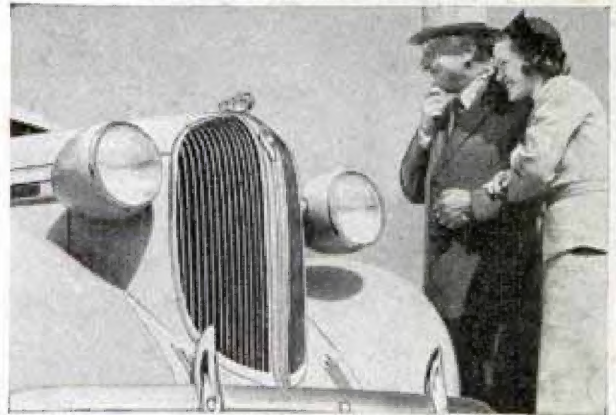
PLYMOUTH'S STORY

The new 1938 Plymouth celebrates the most amazing record in history!

10 years ago, people first saw Plymouth. And they bought by the *thousands*!

No car has ever made friends *so fast*!

Now, the 10th-year Plymouth is here... the greatest car we've built. See it!



1 **Step Up** and look at this beautiful new 1938 Plymouth! See that long hood—bigger headlights—entire car is more distinctive.

COSTS AMAZINGLY LITTLE TO OWN. The Commercial Credit Company offers very easy payment terms on a new Plymouth—through Dodge, De Soto and Chrysler dealers. Tune in Major Bowes' Amateur Hour, Columbia Network, Thursdays, 9 to 10 p. m., E.S.T.



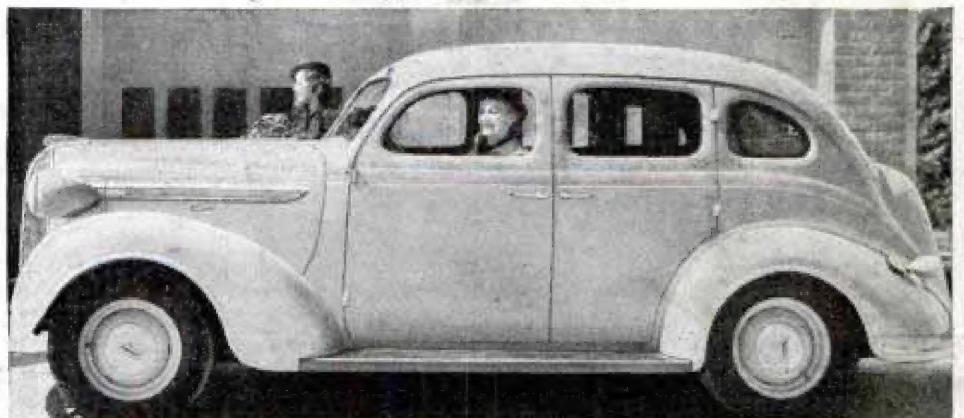
2 **Stretch Out!** Enjoy the greater elbow room, head room and leg room. The whole car "floats" on Amola steel springs, with airplane-type shock-absorbers and rubber body mountings.



3 **Inside this Trunk** is extra baggage space... there's no sill to lift the luggage over. Just slide it in.



4 **New Dials** are easier to read, and the hand-brake is out of the floor, easy to reach!

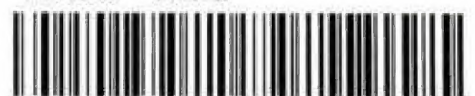


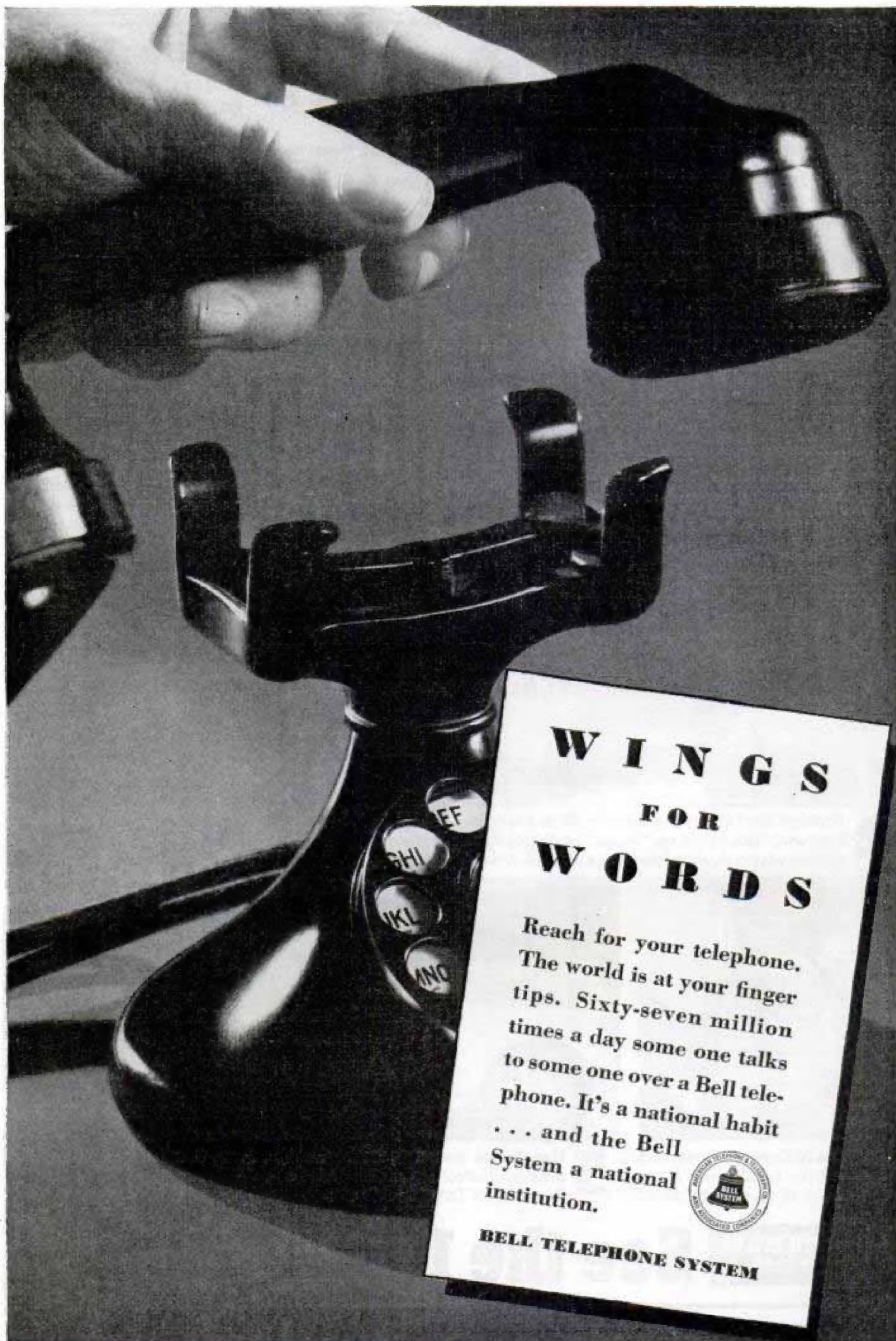
5 **Here's the New 1938 Plymouth...** with *double-action* hydraulic brakes, *all-steel* body, *record economy*—"the car that stands up best!" PLYMOUTH DIVISION OF CHRYSLER CORPORATION, Detroit, Mich.

PLYMOUTH BUILDS GREAT CARS

See the 1938 Plymouth


This One





W I N G S
F O R
W O R D S

Reach for your telephone.
The world is at your finger
tips. Sixty-seven million
times a day some one talks
to some one over a Bell tele-
phone. It's a national habit
... and the Bell
System a national
institution.



BELL TELEPHONE SYSTEM

Popular Mechanics Magazine

H. H. WINDSOR, Founder

H. H. WINDSOR, Jr., Editor and Publisher

December, 1937

Vol. 68, No. 6

Special Features

Easier Shifting in 1938	801
Chemistry—and You—Part I	Coloroto
Miracle Man of Roses	818
Rodents Worth Weight in Gold	826
Latest in Music for the Movies	830
Awakening of the Ghost Towns	834
Inventing Circus Laughs	842
Super-Tires for the Highway Express	850
Modern Magic of the Light Benders	858
Snow—a Billion Dollar Business	866
Around the World for Realism	872
Railroading for Men Only	882
Focusing Your Camera on Christmas	888
Television in Germany	894

(Continued on next page)

Scientists of the Air

IF YOU seek the ultimate in thrills, take a power dive with a test pilot putting a fighting plane through its paces. Four miles up he gives it the gun and you rocket toward the earth at 500 miles an hour. Try to jump out now and you'll fall up. To slow down, the pilot opens his throttle still wider—another result of your speed. Then, for the pull-out, you loose a tremendous shout to constrict your stomach for the strain and your body begins to prickle. Right now your weight is more than half a ton. While you "enjoyed" the ride, the test pilot was jotting down the readings of flickering instrument needles and as you stagger away half-conscious he calmly hands in a record showing what that particular ship will do. You'll find the test pilot article in the January issue.

Next Month

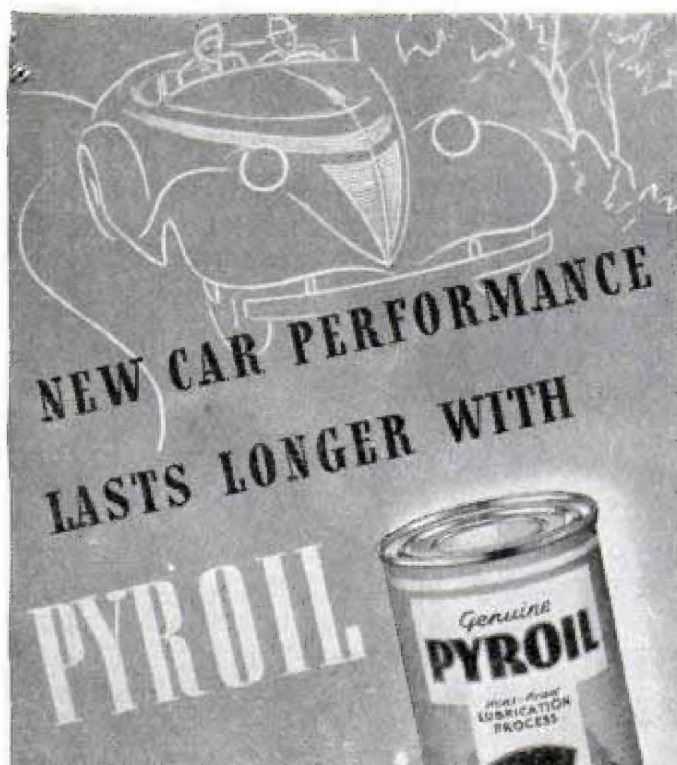
THE textile industry has literally been made over with the aid of chemistry. So has the rubber industry. After reading the first of four articles by Dr. C. M. A. Stine in this issue, you will agree with us that chemistry is a fascinating subject when it is interpreted "so you can understand it." In January Dr. Stine discusses textiles and rubber, and this article also is illustrated with eight pages of Coloroto pictures.

"One—Two—Bob"

PERHAPS you prefer your thrills on the ground instead of riding with a test pilot. If so, may we recommend a bobsled ride down the mountain run at Lake Placid. It is a most exhilarating form of rapid transit because the proximity of the earth and the blurry scenery intensify the sense of speed. An article next month takes you through every turn on this run and we guarantee you'll have the ride of a lifetime.

Speaking of Movies

SPEAKING of movies—home movies—an article next month tells you how not to make them. There are several ways to ruin an otherwise good reel of parlor movies, and once you know what not to do, you'll discover that you are shooting real moving pictures and not a lot of animated snapshots.



Pyroil Will Prevent Corrosive Attack (Metal Wear), Reduce Friction, Heating.

Don't wait until **corrosion* has dulled the excellent performance of your new car. Prevent corrosion by using Pyroil—from the beginning. Pyroil helps to keep your new car up to its intended performance standards. It keeps out gums, carbon and other contaminations. It definitely reduces friction and early wear. Just as waxing protects new body finish, Pyroil preserves new engine parts. You will be money ahead if you use it. You will enjoy your car much longer.

Use only three ounces of Pyroil in the gas tank every 200 miles. Use two ounces to a quart of oil at each crankcase filling. Ask your service station attendant or mail coupon. Manufactured and Guaranteed by Pyroil Company, W. V. Kidder, Founder, 512 Pyroil Building, La Crosse, Wisconsin.

*Corrosion of metal parts — a common engine operation fault — is caused by moisture condensation within the engine. Also by acids which accrue from the combustion of some types of fuels and the heating of some lubricants. Corrosion "eats", or etches, metal parts. Causes their early wear and breakdown. Pyroil prevents corrosion.



DISTRIBUTORS

Check and mail coupon for facts of our unusual Sales Opportunity for you. Start now!

PYROIL COMPANY

512 Pyroil Building, LaCrosse, Wis., U. S. A.

Please send complete Pyroil facts.

☐ Also send details of your plan for Distributors.

Name.....

Address.....

City..... County..... State.....

(Contents—Continued)

AUTOMOTIVE

Cigarette paper tests leather for auto makers.....	822
Screens for auto windows.....	823
Streamlining makes German race car faster.....	823
Miniature trailer house pushes driver on tricycle.....	824
Boat trailer for motorcycle.....	825
Trailer chapel has altar and loudspeaker.....	829
Meter tests auto brake efficiency.....	832
Trailer convertible into permanent cottage.....	833
Auto color map an aid to car builders.....	840
Pancake Diesel engine saves space in aircraft.....	840
Camera catches racing car high off track.....	841
Trailer is headquarters for modern army generals.....	846
Auto trailer built like yacht.....	847
Three-speed wheel chair is run by batteries.....	848
Improved street lighting reduces accidents.....	854
Steam vapor for car heater from new unit.....	855
Armored car with disappearing running boards.....	857
Motor roller built of junked auto parts.....	863
Motorcycle speaker system aids traffic safety.....	864
Repair tool for tire chains.....	870
"Electric eye" replaces mechanical trip.....	876
Glareless lights for driveway.....	876
Three-wheel "teardrop" with motorcycle engine.....	877
Blacksmith shop on truck travels to customers.....	878
"Shadograph" tests accuracy of piston pins.....	878
Shape of molecules shows if gasoline knocks.....	878
Hydraulic bumper jack.....	880
Driver stands on running board while backing.....	886
Valve springs tested without removing engine head.....	891
Color-wheel matches shades exactly.....	892
Automatic transmission passes rigid tests.....	896
Radiator sealed by valve to save anti-freeze.....	124A

AVIATION

Atlantic flying boat to carry sixty-four.....	817
Throat microphone for pilot reduces flying hazards.....	846
"Vest pocket" plane not much bigger than pilot.....	855
Flight analyzer writes log of trip.....	856
Plane controlled like auto speeds amateur flying.....	862
Endurance fliers refuel from speeding auto.....	877
Transatlantic flying hotel has room for sixty.....	893

FARM AND GARDEN

Automatic spading fork saves work.....	856
Crop acreages computed by weighing air maps.....	870
Epsom salts harmless to grasshoppers.....	896

HOUSEHOLD

Cellophane Christmas tree never needs new bulbs.....	824
Waffle iron bakes two at a time.....	829
Faucet is drinking fountain if outlet is stopped.....	855
Bath mat with vacuum cups prevents slipping.....	857
Non-liming shower head throws dual stream.....	879

MODELS

Thirty-five foot model shows fair.....	838
Modeling sheets for tooling like leather.....	847
Tiny tractor model built with jeweler's lathe.....	892

MOVIES AND PHOTOGRAPHY

Wallet for film has transparent pockets.....	821
Camera sees "Miss Liberty" from new angles.....	849
Daylight loading film container.....	862
Kites used for advertising and aerial photography.....	887
Night club set moving on rails.....	893

RADIO AND ELECTRICITY

Variable speed reversible motor.....	824
Periscope helps radio reporter cover golf match.....	857
Flasher for signs replaces costly controls.....	876
Short wave super de luxe.....	897
Two-tube portable emergency receiver.....	898
Self-powered 7-watt a.c.-d.c. audio amplifier.....	900
Hints for radio experimenters.....	901
One antenna serves many sets.....	902
Portable six-volt power unit.....	902
Radio receiver hangs on wall.....	902
Variable-voltage transformer for radio service men.....	902
Electric theater in the sky in Osaka.....	134A

SCIENCE AND INDUSTRY

Fireproof paint guards work.....	833
Water made "wetter than wet" by chemical.....	840
Carbon "ice" nearest approach to absolute zero.....	856
Drought precipitates salt in Great Salt lake.....	880

(Continued to page 6A)

*Half & Half Makes
One Swell Gift!*

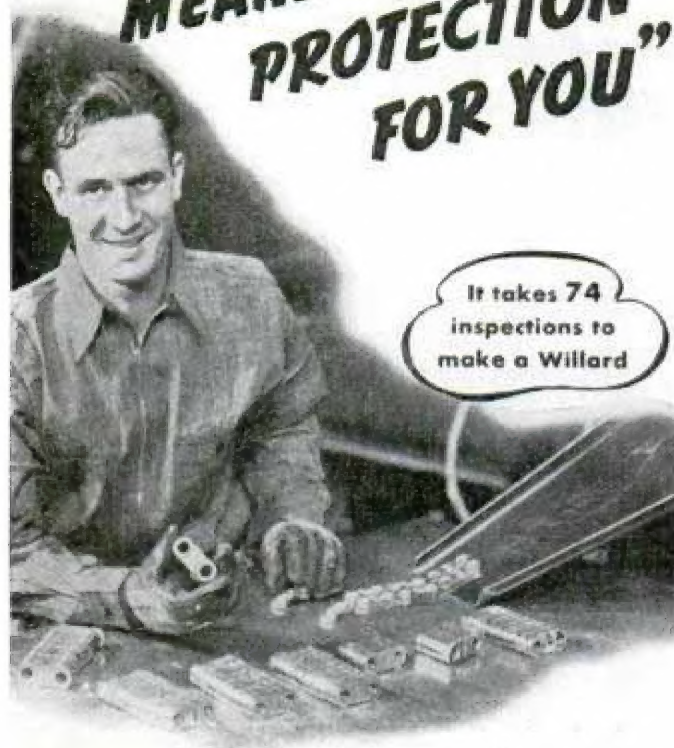


It's a present with a future—makes every day a holiday for the pipe-smoker. Cool as his thought of those gadgets he'll get. Smooth as his grin at a pound tin instead! Fragrant, friendly, full-bodied tobacco that won't bite the tongue—in a tin that won't bite the fingers. Made by our exclusive modern process including patent No. 1,770,920. Cool and smooth. Smells good. Makes his pipe welcome anywhere. Tastes good. His password to pleasure—your buy-word for smokers!

Copyright 1937,
The American Tobacco Company

HALF ^{AND} HALF
The Safe Pipe-Tobacco
FOR PIPE OR CIGARETTE

**"MORE CARE HERE
MEANS GREATER
PROTECTION
FOR YOU"**



"It's the little things that count in building batteries. These 'top connectors' form the electrical connection from one cell to another in a battery. A flaw might cause an open circuit—complete loss of battery power—just when you most need dependable performance.

"So, at the Willard factory, we inspect every top connector carefully—only those that are perfect get by!"

★ ★ ★

Willard makes rigid inspections at every step in manufacture to protect you against emergencies and give you dependable starting day in and day out.

This care in manufacture, coupled with the finest materials and expert workmanship, is the reason Willards last longer, crank faster and don't let you down.

So when you buy a battery—buy more safety, surer starts and greater economy—go to the nearest of 42,000 Willard dealers, buy a Willard.

WILLARD STORAGE BATTERY CO.

Cleveland • Los Angeles
Toronto, Canada



Willards

COST LESS TO OWN!

Because they . . . last longer . .
crank faster . . don't let you down

(Contents—Continued)

TOOLS

Tool for cutting holes in heavy metal	822
Magazine-loading tack hammer	832
Flux cleans and tins in one operation	864
Scissor-like gauge for measuring pulley belts	870

MISCELLANEOUS

Electric reed organ on wheels	821
Lake drained by boring hole in bottom	821
Shoe irons for climbing steel girders	822
Weather machine tests materials	825
Water atomizer keeps fruits and vegetables fresh	832
Fireworks burst from Eiffel tower	839
Windmill's wings fold to give more power	839
"Human fireworks" in asbestos	841
Blades coiled in razor like movie film	846
Fish made seasick by tossing of boat	848
Propeller that won ribbon for "Normandie"	848
Fog signal using heat rays is successful	849
India traffic cop shaded by concrete umbrella	862
Special tires increase farm tractors' power	863
Film staff in black to control lighting	864
Cameras help coast artillery improve aim	865
Portable steel scaffold units of welded tubing	870
Decorators weave web of steel in cathedral	871
Rubber seats for trains and buses	879
Bank deposit dropped in chute saves time	880
Hunting goeduck with shovels on Puget Sound	881
Mile-a-minute trains of U. S. lead in mileage	886
Twelve-inch mortar in artillery practice	887
Surf riding skis on water and snow	891

Craftsman and Shop Notes

AUTOMOTIVE

Can you see them in time?	955
Air vent in gas line foils bandits	958
Body lamps light interior of truck	958
Differential breather keeps grease out of brakes	958
Oil vapor gums generator brushes	958
Keeping children from sounding the horn	959
Loose bearings detected by oil-pressure system	959
Oil in cylinder boosts off head	959
Puller for axles and driveshafts	959
Garage doors automatically held open by latches	960
Garment hanger for your car	960

ELECTRICAL

Christmas-tree lamps tested in flashlight	907
Electricity plays this "vibro" fiddle	913
Fuse block for experimenter's bench	934

FARMS

Wax to prevent trees bleeding after pruning	927
Feed grinder belt made from auto tire	944
Grinder driven by transmission from old auto	946
Walking plow moved on runner	953

FURNITURE

Lamp table with matched veneer top	903
Students' study cabinet	929
Foldaway cabinet serves as writing desk	937

HAND TOOLS

Protractor scale on folding rule	910
Removing tight stud bolts	910
Soldering-iron rest from metal spool	910
Attachment to convert bench vise into anvil	917
End wrenches with rounded noses	920
Center of shafts found with V-block and square	945
Rubber washers hold rivets for clinching	954

HOME IMPROVEMENTS

Three little shelves	911
Preventing flue effect in studs of "balloon" frame	912
Whitewashing basement walls	929
Bookshelves built in a corner	930
Taking the "stick" out of doors	937
Installing wall grilles for air conditioning	947

HOUSEHOLD

Ice shaved on cabbage cutter	906
New "blonde" finish on maple plant tree	908
Novel toothbrush holders for small children	917

(Continued to page 8A)

When jobs are looking for men -that's news!



..... NOW IS THE TIME!

RIGHT now, in many lines there is a search for really good men—managers, leaders—men who can take charge of departments, businesses, branch offices, and set things humming.

As always, there are not enough ordinary jobs to go 'round—but rarely before in the history of American business, has there been so much room at the top! New jobs are being created by the business pick-up in almost all lines.

Ordinarily, there would be plenty of men to fill these jobs—men in junior positions who have been studying in spare time. But most men have been letting their training slide during these dark years of depression . . . "What's the use?"—You have heard them say. Perhaps there has been some excuse for sticking to any old kind of a job one could get the past few years—but the door is wide open for the man with ambition NOW!

And don't let anyone tell you that "Opportunity Only Knocks Once"—that's one of the most untruthful sayings

ever circulated. Opportunities flourish for every American every day of his life.

Far more to the point is to be ready—be prepared—to make yourself interesting to the big-time employer—and, LaSalle offers you a short-cut method of qualifying for opportunity jobs in accounting, law, traffic, executive management, and kindred occupations.

LaSalle Extension is 29 years old—nearly 40,000 students enroll annually—60 American firms each employ 500 or more LaSalle-trained men—surveys show that LaSalle students attain 40% average salary increase after graduation—nearly 10% of all C. P. A.'s in the U. S. A. are LaSalle alumni—in two states over 60% of the C. P. A.'s are LaSalle-trained men.

Why not find out what LaSalle has done and is doing for men in your position? Send and get the facts; see what LaSalle can do for you, personally!

There's no question about it—business is picking up—jobs are looking for trained men—the time has come for you to qualify for prosperity. Mail this coupon today!

LaSalle Extension University, Dept. 1264-R, Chicago.

Kindly send me your free booklet on the business field I have checked—and tell me how your training in that field can help me.

☐ Business Management ☐ Business Correspondence ☐ Salesmanship ☐ Law ☐ Commercial Law
☐ Business English ☐ Traffic Management ☐ Accountancy ☐ Bookkeeping ☐ Stenotypy

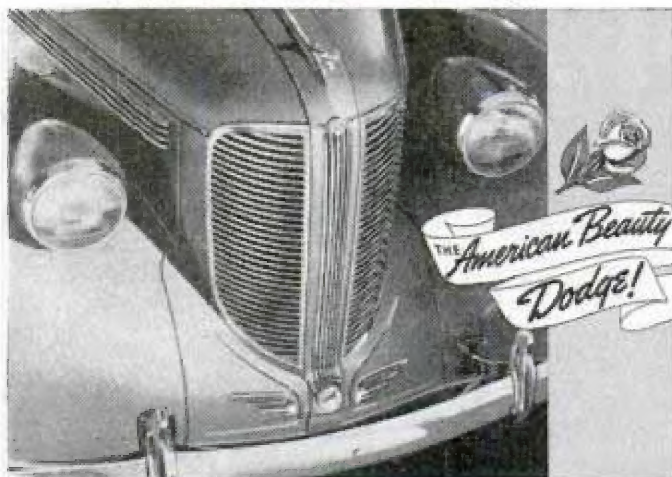
Name..... Position.....

Address.....

LASALLE EXTENSION UNIVERSITY

When writing to advertisers please mention Popular Mechanics

IT'S HERE TO SAVE YOU MONEY!



The Most Beautiful Car Dodge Ever Built...With 47 Progressive Improvements and Refinements!

COMBINING sensational economy and traditional Dodge dependability with 47 progressive new improvements, the new 1938 Dodge tops it all with distinguished new styling, inside and out, to give you the most beautiful, *extra-value* Dodge of them all!

See the new "American Beauty" Dodge today! Drive it! Learn why owners everywhere are reporting 18 to 24 miles to the gallon of gasoline! And don't forget that this Dodge too delivers for just a few dollars more than lowest-priced cars! Easy terms gladly allowed to fit your budget, at low cost, through Commercial Credit Company.

Tune in on the Major Bowes Original Amateur Hour, Columbia Network, every Thurs., 9 to 10 P. M., E. S. T.

Switch Now
TO THE NEW 1938
DODGE
and Save Money!

STILL DELIVERS FOR JUST A FEW DOLLARS MORE THAN LOWEST-PRICED CARS!

(Contents—Continued)

Litharge cement has many uses	919
Shaper to dry infants' sweaters.....	920
Rubber-head tacks hold towels on rack	928
Portable reel for your clothesline	934
Easy solutions for your problems	938

OFFICE

Improvised holder for ink bottles	907
Reflector on drawing board	907
Ball clip on pencil makes stylus	947

POWER TOOLS

Sawing resinous woods on band saw	928
Homemade shaper has ball-bearing spindle	941
Centering lathe tools accurately	946

STORE AND SHOP

Indexing pin on drill press	920
Jig to bend light angle iron	927
Store window decorated with aid of mirror	943
Basket on sliding ladder for shoe clerk	944
Refrigerator thermometer with magnifying glass.....	944
Tool removes drill burrs inside boilers	946
Carving board holds roasts firmly for slicing	947
Roller-skate dolly to move heavy boxes	953
Furniture salesman illustrates with blackboard.....	954
Shipping tags held on darning needle	954

WOODWORKING

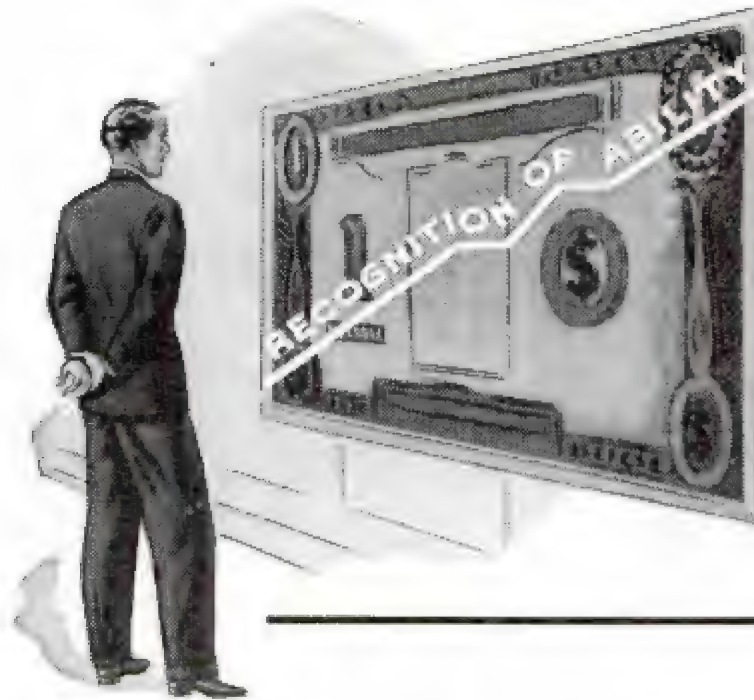
Crumb tray and comb turned in one piece.....	905
Tool rack to hold lathe turning chisels	928
Decorative hot-dish mats sawed from wood	929
Candlesticks in wood	935
Gluepot kept warm in "cozy"	936
Planing thin work	943
Jig for dividing work into equal spaces	945
Spindle turning	948

MISCELLANEOUS

Beehives sterilized with blowtorch	905
Cutter handles roofing paper without cleaning.....	906
Expeller removes leaves from garden rake teeth.....	906
Filler pipe on kerosene pipe telescopes	906
Glass covers for chemists' acid bottle	906
Autographs protected by Cellophane	907
"Saddle bags" for your baby carriage	910
Applying grommets to sails	912
Centering device to cut sheet-metal disks	912
Screen-wire spreader for glue	912
Holder for bottle cap to serve hot liquids	913
Building sturdy "snowliner"	914
Mixture for gilding	917
Cutter to shape thin balsa wood	918
Flameproofing your Christmas tree	918
How to remove rust stains from white cloth	918
Tubes of color identified by tags	918
Chemists' aspirator made for ten cents	920
Ice creepers from steel belt lacing	920
Christmas cards made at home	921
Float in gluepot keeps brush handle clean	927
Negative washer from film spool	927
Photo-developing solutions protected by marbles.....	928
Skates sharpened with aid of small level	928
Life of Christmas-tree lights increased	933
Tape measure has lead edges for irregular work.....	933
Weatherboarding put up single-handed.....	933
Repairing broken knife handles	934
Scale on knitter's bag always at hand	934
Knife lubricant for cutting rubber	936
Repairing worn cylinder locks	936
Rubber holders prevent breakage of bottle stoppers.....	936
Drinking fountain on faucet assembled from pipe.....	937
Looking on top of high shelves	940
Pencil sharpener points small dowels	940
Rolled canvas protects baggage on truck	943
Support for window sign writer's hand	946
Determining thickness of microscope specimen.....	953
Shield protects uniform while polishing buttons.....	954

IMPORTANT NOTICE

It is the intention of this magazine to provide its readers with information regarding the latest developments in the mechanical arts. We take no responsibility as to whether the disclosures contained in our articles are covered by patents and advise readers to investigate this subject before making, using, or selling any of the products, machines, or processes described, in order to avoid possible liability for patent infringement.



Money is **MORE** than pay

• "He's a twenty-dollar-a-week man" means far more than the actual cash a man receives in his pay envelope. It indicates the type of man he is. It indicates at least one thing beyond doubt — his training is limited. And thousands of men, tired of being twenty . . . thirty . . . forty . . . fifty-dollar-a-week men, have removed this limitation of training by mastering International Correspondence Schools Courses. When you complete an I. C. S. Course, you are a trained man! And you can do it in spare time. The coupon will bring you complete information.

INTERNATIONAL CORRESPONDENCE SCHOOLS

BOX 5693-H, SCRANTON, PENNA.



Without cost or obligation, please send me a copy of your booklet, "Who Wins and Why," and full particulars about the subject *before* which I have marked X:



TECHNICAL AND INDUSTRIAL COURSES		
<input type="checkbox"/> Architect <input type="checkbox"/> Architectural Draftsman <input type="checkbox"/> Building Estimating <input type="checkbox"/> Contractor and Builder <input type="checkbox"/> Structural Draftsman <input type="checkbox"/> Structural Engineer <input type="checkbox"/> Management of Inventions <input type="checkbox"/> Electrical Engineer <input type="checkbox"/> Electric Lighting <input type="checkbox"/> Welding, Electric and Gas <input type="checkbox"/> Reading Shop Blueprints <input type="checkbox"/> Heat Treatment of Metals	<input type="checkbox"/> Sheet Metal Worker <input type="checkbox"/> Boilermaker <input type="checkbox"/> Telegraph Engineer <input type="checkbox"/> Telephone Work <input type="checkbox"/> Radio <input type="checkbox"/> Mechanical Engineering <input type="checkbox"/> Mechanical Draftsman <input type="checkbox"/> Machinist <input type="checkbox"/> Toolmaker <input type="checkbox"/> Patternmaker <input type="checkbox"/> Diesel Engines <input type="checkbox"/> Aviation Engines <input type="checkbox"/> Automobile Mechanic <input type="checkbox"/> Refrigeration	<input type="checkbox"/> Plumbing <input type="checkbox"/> Steam Fitting <input type="checkbox"/> Heating <input type="checkbox"/> Ventilation <input type="checkbox"/> Air Conditioning <input type="checkbox"/> Steam Engineer <input type="checkbox"/> Steam Electric Engineer <input type="checkbox"/> Marine Engineer <input type="checkbox"/> R. R. Locomotives <input type="checkbox"/> R. R. Section Foreman <input type="checkbox"/> Air Brakes <input type="checkbox"/> R. R. Signalmen <input type="checkbox"/> Highway Engineering <input type="checkbox"/> Civil Engineering <input type="checkbox"/> Surveying and Mapping
BUSINESS TRAINING COURSES		
<input type="checkbox"/> Business Management <input type="checkbox"/> Industrial Management <input type="checkbox"/> Traffic Management <input type="checkbox"/> Accountancy <input type="checkbox"/> Cost Accountant <input type="checkbox"/> C. P. Accountant	<input type="checkbox"/> Bookkeeping <input type="checkbox"/> Secretarial Work <input type="checkbox"/> Spanish <input type="checkbox"/> French <input type="checkbox"/> Salesmanship <input type="checkbox"/> Advertising	<input type="checkbox"/> Bridge Engineer <input type="checkbox"/> Bridge and Building Foreman <input type="checkbox"/> Chemistry <input type="checkbox"/> Pharmacy <input type="checkbox"/> Coal Mining <input type="checkbox"/> Mine Foreman <input type="checkbox"/> Fire Boilers <input type="checkbox"/> Navigation <input type="checkbox"/> Cotton Manufacturing <input type="checkbox"/> Wooden Manufacturing <input type="checkbox"/> Agriculture <input type="checkbox"/> Fruit Growing <input type="checkbox"/> Poultry Farming
DOMESTIC SCIENCE COURSES		
<input type="checkbox"/> Home Dressmaking <input type="checkbox"/> Professional Dressmaking and Designing	<input type="checkbox"/> Advanced Dressmaking	<input type="checkbox"/> Food and Cookery <input type="checkbox"/> Tea Room and Cafeteria Management, Catering

Name.....Age.....Address.....

City.....State.....Present Position.....

If you reside in Canada, send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada



Our Graduates Run 47% of ALL the Identification Bureaus in America!

Here's a Partial List of City and State Institutions In Which Our Graduates Were Placed As FINGER PRINT EXPERTS

Arrest Him, Officer!
I'll have complete facts on
the other fellow tonight!



Send for complete list of over 600 bureaus where our graduates are placed. THEN write the nearest bureau and learn what our graduates think of us.

State Bureau of Massachusetts	Sault Ste. Marie, Mich.	Gadsden, Ala.	Orangeburg, S. C.	Seranton, Pa.
State Bureau of Illinois	Billings, Mont.	Decatur, Ga.	Berkeley, Calif.	Mobile, Ala.
State Bureau of Iowa	Laconia, N. H.	Anderson, Ind.	Lancaster, Ohio	Lincoln, Neb.
State Bureau of Idaho	Salem, N. J.	Massillon, Ohio	Mingo Jet., Ohio	Seattle, Wash.
State Bureau of Colorado	Cedar Rapids, Ia.	Waltham, Mass.	Okmulgee, Okla.	Ferndale, Mich.
State Bureau of Washington	London, Ohio	Grand Forks, S.D.	Hazleton, Pa.	McAlester, Okla.
State Bureau of Michigan	Elgin, Ill.	Bremerton, Wash.	Yakima, Wash.	Negaunee, Mich.
State Bureau of Utah	Miami Beach, Fla.	Long Beach, Cal.	Oklahoma City, Okla.	Lawton, Okla.
State Bureau of Ohio	Asheville, N. C.	Ft. Worth, Texas	Des Moines, Iowa	Crown Point, Ind.
Pittsburg, Calif.	Ft. Scott, Kans.	Nunda, N. Y.	E. Lansing, Mich.	Bay City, Mich.
Kokomo, Ind.	Augusta, Ga.	St. Louis, Mo.	Globe, Ariz.	Roanoke, Va.
El Reno, Okla.	Florence, S. C.	Lansing, Mich.	Hamtramck, Mich.	Chatham, Ont., Canada
Boston, Mass.	Hinsdale, Ill.	Salisbury, N. C.	London, Ont., Canada	Glendale, Calif.
Mexico City, Mex.	New Bedford, Mass.	Elyria, Ohio	Canada	Joplin, Mo.
Parsons, Kans.	Neosho, Mo.	Carson City, Nev.	Canada	Lima, Mo.
Tallahassee, Fla.	Sapulpa, Okla.	Burlington, Iowa	Canada	Selma, N. C.
Columbia, S. C.	New York, N. Y.	West Chicago, Ill.	Canada	Stillwater, Okla.
Hull, Que., Can.	Lufkin, Texas	Amarillo, Texas	Canada	Drumright, Okla.
Portsmouth, Ohio	Tijuana, Mexico	Winfield, Kans.	Canada	Victoria, B. C., Canada
Selma, Ala.	Berlin, N. H.	Cambridge, Ohio	Canada	Baton Rouge, La.
Atchison, Kans.	Greenville, S. C.	South Orange, N.J.	Canada	Hawaiian Islands
Hot Springs, S.D.	Havana, Cuba	Savannah, Ga.	Canada	Parkersburg, W. Va.
Glens Falls, N. Y.	Seattle, Wash.	Omaha, Neb.	Canada	Mobile, Ala.
	Meridian, Miss.	Patterson, N. J.	Canada	Huntsville, Texas
	Dodge City, Kans.	Beverly, Mass.	Canada	New Iberia, La.
	Danville, Va.	Canon City, Colo.	Canada	Sheridan, Wyo.
	Easton, Pa.	St. Cloud, Minn.	Canada	Little Rock, Ark.
	Syracuse, N. Y.	Franklin, Mass.	Canada	Aberdeen, S. D.
	El Centro, Calif.	San Juan, P. R.	Canada	Ada, Okla.
	Tampa, Fla.	Henderson, N. C.	Canada	Pontiac, Mich.
		Erie, Pa.	Canada	Granite, Okla.
		Pecos, Texas	Canada	Wichita Falls, Texas
			Canada	Boise, Idaho
			Canada	Bartlesville, Okla.
			Canada	Miami, Fla.
			Canada	Orlando, Fla.
			Canada	York, Pa.
			Canada	St. Paul, Minn.
			Canada	Pittsburgh, Pa.
			Canada	Walla Walla, Wash.
			Canada	Lincoln, Neb.
			Canada	Birmingham, Ala.
			Canada	Columbus, Ohio
			Canada	Havana, Cuba
			Canada	New Haven, Conn.
			Canada	Great Falls, Mont.
			Canada	Galveston, Texas
			Canada	Houston, Texas
			Canada	Waterloo, Iowa
			Canada	Windsor, Ont., Canada
			Canada	Pueblo, Colo.
			Canada	Idaho Falls, Ida.
			Canada	Fort Collins, Colo.
			Canada	Bedford, Ohio
			Canada	Huntington, W.V.
			Canada	Salt Lake City, Utah
			Canada	Taft, Calif.
			Canada	Jamestown, N. Y.
			Canada	Phoenixville, Pa.
			Canada	Atlanta City, N. J.
			Canada	Sioux City, Ia.
			Canada	Rochester, N. Y.
			Canada	Media, Pa.

Want a Regular Monthly Salary?

Be a Secret Service and Identification Expert!

Enjoy all the thrill of getting your man!—with no personal danger—PLUS a regular monthly paid salary and the opportunity to share in Rewards. Become a well paid Finger Print and Crime Detection Expert. Learn at home—in your spare time—and at low cost—the unique secrets of this young, fascinating and fast growing profession. You have exactly the

same opportunity that was offered the hundreds of our graduates who now hold splendid positions in the more than 600 institutions partially listed on this page. Each of these bureaus has anywhere from ONE to FIFTEEN of our graduates on regular monthly salaries—and new openings develop from time to time.

Wonderful Opportunity for TRAINED MEN in This Young, Fast Growing Profession

Of the many thousands of cities in America, more than three-fourths are STILL without identification bureaus and many more are bound to come! That spells OPPORTUNITY! But you must be READY for it! ANY man of average intelligence

can quickly master this profession that combines thrills with personal safety AND the security of a steady income! We show you HOW—just as we have already shown the hundreds who now hold good pay positions.

FREE! The Confidential Reports No. 38 Made to his Chief

Rush coupon for YOUR free copy of these reports! Follow Operator No. 38 on his exciting hunt for a murderous gang of counterfeiters. BETTER than Fiction, because every word is TRUE. ALSO, get free, "The Blue Book of Crime," showing the wonderful opportunities in the field of Finger Prints and Crime Detection. Take TODAY your first step toward a steady income and success! Mail the coupon AT ONCE.

INSTITUTE OF APPLIED SCIENCE
1520 Sunnyside Ave., Dept. 1359, Chicago

INSTITUTE OF APPLIED SCIENCE
1520 Sunnyside Ave., Dept. 1359, Chicago.

Gentlemen: Without any obligation on my part whatever, send me the Confidential Reports of Operator No. 38, also illustrated "Blue Book of Crime", complete list of bureaus employing your graduates, together with your low prices and Easy Terms offer. (Literature will be sent ONLY to persons stating their age.)

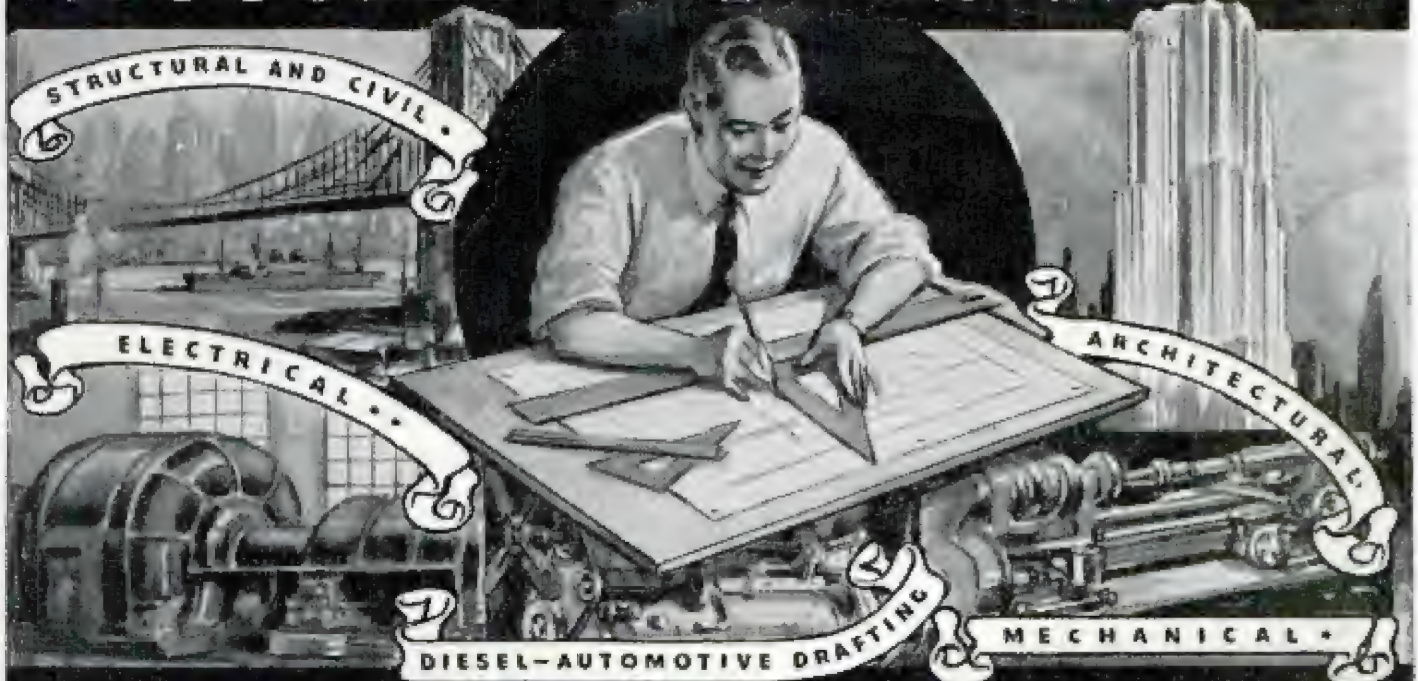
Name.....

Address.....

Age.....

When writing to advertisers please mention Popular Mechanics

Become a Draftsman



Enjoy a Real Job in Industry

Steady Work

As nearly all manufacturing—construction—building starts on the drafting table, the draftsman is one of the first to be hired and one of the last to be laid off. It is his blueprints, his specifications, that give the last word in what the workmen are to do. No article—building or construction job is started before the plans drawn by the draftsman have been officially approved.

Good Pay

The draftsman has been called the Junior Engineer which title just about describes his work—position and pay. He combines his knowledge of principles, mechanism and construction details with the ability to draw and reproduce motions and methods on paper. On the average, his salary is considerably above the wages of the mechanic and, of course, less than that of the engineer.

Chance for Promotion

Working on plans, helping design new machines or new methods of construction, the draftsman is working directly with the important men of the organization. Consequently he knows what is being considered and planned. It may be the superintendent—the engineer—or even the prospective buyer with whom he consults. Because of these contacts, his experience and knowledge of the business in general he is in an excellent position to be promoted when next there is a good opening.

Young at 40

Athletes—farmers—and factory and shop workers who rely on muscle start growing old even before they reach 40 while office workers—executives—teachers—professional men, in fact, all kinds of brain-workers are just approaching their prime at 40 to 50. Training increases your value at once and continues to help boost your earning power as you mature and as you increase your experience and background for forming judgments of the firm's policies and methods.

Don't grow old at 40. Train now for the job you want at 50. Training helps you to be independent—self-supporting. It helps you to enjoy associations that are denied the untrained man. Training helps you to increase your earning power and by so doing to offer members of your family advantages far in excess of what you could give them as an untrained man. Train and enjoy **PROGRESS—CONTENTMENT—INDEPENDENCE.**

American School, Drexel at 58th, Chicago

Mail Coupon for 2 Lessons Free

American School, Dept. DD-945

Drexel Ave. at 58th St., Chicago

Without the slightest obligation, send 2 beginning Drafting Lessons and free Bulletin.

Name.....Age.....

Address.....

City.....State.....

2 Lessons Free

Test yourself — see how readily ★
you, too, can learn Drafting

NATIONAL CARBON COMPANY, INC.
specifically
GUARANTEES
 that "Eveready" "Prestone" anti-freeze, if used according to printed directions, in normal water cooling systems, will protect the cooling system of your car against freezing and clogging from rust formations for a whole winter; also that it will not boil away, will not cause damage to car finish, or to the metal or rubber parts of the cooling system, and that it will not leak out of a cooling system tight enough to hold water.

NATIONAL CARBON COMPANY, INC.
 GENERAL OFFICES: NEW YORK, N. Y. BRANCHES: CHICAGO - SAN FRANCISCO
 UNIT OF UNION CARBIDE AND CARBON CORPORATION

THEY TOLD ME IT WAS JUST AS GOOD... BUT IT MUST HAVE BOILED AWAY DURING THE WARM SPELL LAST WEEK.

GET RIGHT IN FOLKS, WE'LL HAVE YOU HOME IN NO TIME.

I DON'T KNOW WHAT WE WOULD HAVE DONE IF YOU HADN'T COME ALONG... WE'RE NEARLY FROZEN

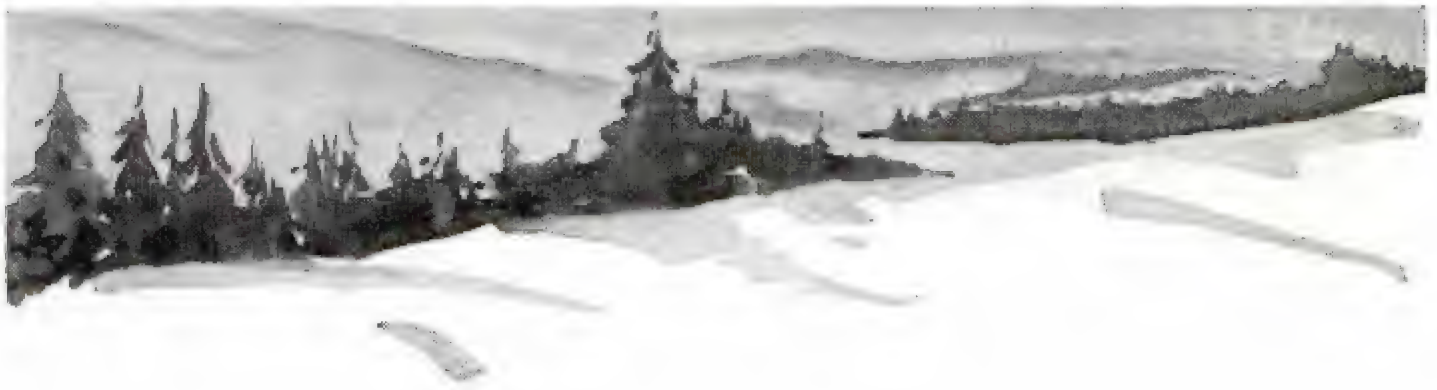
I'M COLD I WANNA GO HOME

"NEXT TIME, NEIGHBOR, GET THE GUARANTEED ANTI-FREEZE... READ THAT... THERE'S NOTHING ELSE LIKE IT!"

EVEREADY

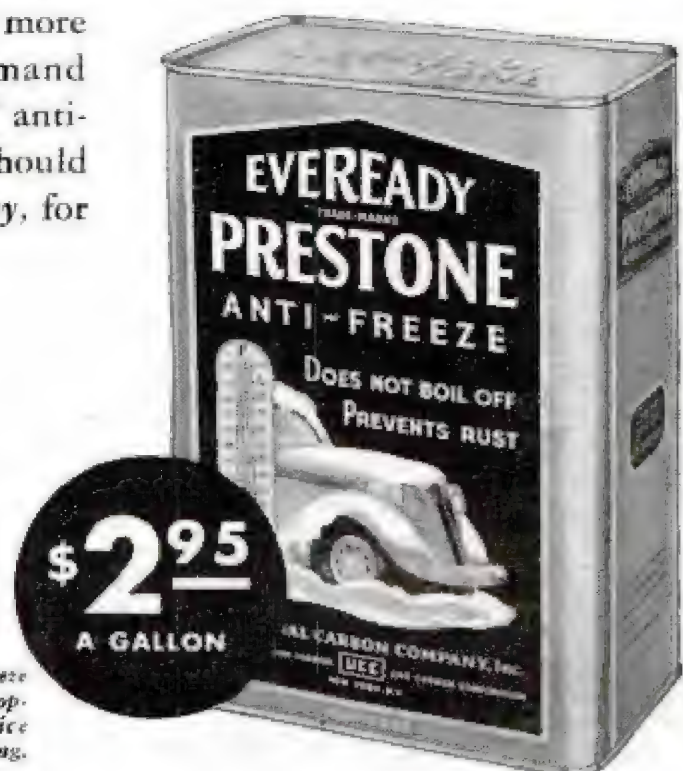
TRADE-

ANTI-FREEZE IS



AMONG all the brands available to U. S. motorists, there's no other anti-freeze like "Eveready" "Prestone." This anti-freeze is guaranteed, insures you against FREEZE-UP, BOIL-AWAY and RUST-CLOGGING, the three winter purse-snatchers that cost American motorists millions of dollars every year. • But when you gamble on anti-freeze you risk more than money...you take chances with your family's health and safety, hazard all-winter comfort, wreck your peace-of-mind.

• Every year millions more decide on safety, demand "Eveready" "Prestone" anti-freeze. So perhaps you should get yours early...*Today*, for example.



Buy "Prestone" anti-freeze from dealers who are properly equipped to service your car for winter driving.

PRESTONE

MARKS

GUARANTEED IN *Writing*

DIESEL PLANES

SPAN THE ATLANTIC



Giant Seaplane Reaches U.S. On Transatlantic Flight

Port Washington, N. Y.—The 19-ton, Diesel-powered seaplane, Nordmeer, landed here today after a 150-mile-an-hour flight from the Azores, 2392 miles away. The flight was the last leg of a survey trip from Berlin by way of Marseilles, Lisbon, and the Azores in advance of regular service over the same route early next year.

The Nordmeer and a sister ship, the Nordwind, both powered by four 600 horsepower Diesel motors, are scheduled to make seven more trips this year.

Los Angeles, Calif. — Commenting on the transatlantic flight of the seaplane Nordmeer, Ralph Hemphill, president of the Hemphill Diesel Schools, predicted today that "the time is not far distant when all trans-oceanic planes will be Diesel-powered, because of the safety from fire, and great dependability and economy."

**FREE
SPECIAL
AVIATION
"DIESEL NEWS"**

— GET YOUR COPY — SEND COUPON —
HEMPHILL DIESEL SCHOOLS (addresses at right)

Please send special aviation issue of "Diesel News" and complete information on Hemphill Diesel training.

Name..... Age.....

Street.....

City..... State..... *NY-27-p*

New Horizons Conquered By Diesel Power . . .

One by one, Diesel engines are conquering every power need. This "miracle" power is sweeping the world.

Land, Water, and NOW AIR

. . . yields to Diesel. With the successful completion of this spectacular flight, the years of Diesel aircraft experimentation come into the open. It is now a challenge to the world.

Now added to the long roster of Diesel users—great truck lines, tractors for farm and industry, construction machinery, electric power plants, irrigation projects, ocean-going vessels, railroads, and numerous others—are these great seaplanes. Indicating universal Diesel power for aircraft, and

Herolding Greater Opportunity Than Ever Before—for the TRAINED DIESEL MAN . . .
for the man who **KNOWS** Diesel engines . . .
for the man who can take charge of sales, operation, installation, maintenance, and repairs for Diesel engine builders and users. Train now for a career in this ever-growing field at

HEMPHILL DIESEL SCHOOLS

. . . where you get training **PROVED** by the success of the many Hemphill graduates . . . where you learn on real Diesel engines . . . where you get the most thorough, most practical Diesel course available . . . where you have your choice of complete full-time or "home-and-shop" courses. Send coupon to nearest school.

BOSTON	114 Brookline Avenue
NEW YORK	31-26 Queens Boulevard, L. I. C.
DETROIT	2341 West Lafayette Boulevard
CHICAGO	2014 Larrabee Street
MEMPHIS	417 Monroe Avenue
LOS ANGELES	2120 San Fernando Road
SEATTLE	501 Westlake North
VANCOUVER, B. C.	1363 Granville Street



J. E. SMITH, Pres., National Radio Institute
Established 1911

The man who has directed the home study training of more men for the Radio Industry than any other man in America.



Broadcasting Stations

Employ managers, engineers, operators, installation and maintenance men for fascinating work and pay up to \$5,000 a year.

Set Servicing

Spare time set servicing pays many \$5, \$10, \$15 a week extra while learning. Full time servicing pays as much as \$30, \$50, \$75 a week.



Loud Speaker Systems

Building, installing, servicing and operating public address systems is another growing field for men well trained in Radio.



HERE'S PROOF THAT MY TRAINING PAYS



\$50 Monthly in Spare Time
"I work on Radio part time, still holding my regular job. Since enrolling seven years ago, I have averaged around \$50 every month."
JOHN H. MORRISSETTE, 800 Valley St., Manchester, N. H.
Makes \$50 to \$60 a Week

"I am making between \$70 and \$80 a week after all expenses are paid, and I am getting all the Radio work I can take care of, thanks to N. R. I."

H. W. SPANGLER, 1201 1/2 S. Gay St., Knoxville, Tenn.

Operates Public Address System
"I have a position with the Los Angeles Civil Service, operating the Public Address System in the City Hall Council. My salary is \$170 a month." **R. R. BOOD, R. 130, City Hall, Los Angeles, Calif.**



Be a Radio Expert

Many make **\$30 \$50 \$75** a week

I will train you at home for many Good Spare Time and Full Time Radio Jobs

Do you want to make more money? Radio offers you many opportunities for well-paying spare time and full time jobs. You don't have to give up your present job, leave home or spend a lot of money to become a Radio Expert.

Many Radio Experts Make \$30, \$50, \$75 a Week

Radio broadcasting stations employ engineers, operators, station managers and pay up to \$5,000 a year. Spare time Radio set servicing pays many \$200 to \$500 a year—full time jobs with Radio jobbers, manufacturers and dealers as much as \$30, \$50, \$75 a week. Many Radio Experts operate full or part time Radio sales and service businesses. Radio manufacturers and jobbers employ testers, inspectors, foremen, engineers, servicemen, paying up to \$4,000 a year. Radio operators on ships get good pay, see the world besides. Auto-mobile, police, aviation, commercial Radio, loud speaker systems are newer fields offering good opportunities now and for the future. Television promises to open many good jobs soon. Men I have trained have good jobs in these branches of Radio. Read their letters. Mail coupon.

There's a Real Future in Radio for Well Trained Men

Radio already gives good jobs to more than 300,000 people. In 1935, Radio enjoyed one of its most prosperous years. More than \$300,000,000 worth of sets, tubes and parts were sold—an increase of more than 60% over 1935. Over a million Auto Radios were sold, a big increase over 1935. 24,000,000 homes now have one or more Radio sets. More than 4,000,000 autos are Radio equipped. Every year millions of sets go out of date, are replaced with newer models. More millions need servicing, new tubes, repairs, etc. A few hundred \$30, \$50, \$75 a week jobs have grown to thousands in 20 years. And Radio is still a new industry—growing fast!

Many Make \$5, \$10, \$15 a Week Extra in Spare Time While Learning

Almost every neighborhood needs a good spare time serviceman. The day you enroll I start sending Extra Money Job Sheets showing how to do Radio re-

pair jobs. Throughout your training I send plans and ideas that make good spare time money for hundreds. I send Special Equipment to conduct experiments, build circuits, get practical experience. I GIVE YOU A COMPLETE, MODERN, PROFESSIONAL ALL WAVE, ALL PURPOSE RADIO SET SERVING INSTRUMENT TO HELP SERVICE SETS QUICKER—SAVE TIME, MAKE MORE MONEY.

I Give You Practical Experience

My Course is not all book training. I send you special Radio equipment; show you how to conduct experiments, build circuits illustrating important principles used in modern Radio receivers, broadcast stations and loud-speaker installations. I show you how to build testing apparatus for use in spare time work from this equipment. This 50-50 method of training makes learning at home interesting, fascinating, practical.

You Get a Money Back Agreement

I am sure I can train you successfully. I agree in writing to refund every penny you pay me if you are not satisfied with my Lessons and Instruction Service when you finish. I'll send you a copy of this agreement with my Free Book.

Find Out What Radio Offers You

Act Today. Mail the coupon now for "Rich Rewards in Radio." It's free to any fellow over 16 years old. It points out Radio's spare time and full time opportunities and those coming in Television; tells about my training in Radio and Television; shows you letters from men I trained, telling what they are doing and earning. Find out what Radio offers YOU! MAIL COUPON in an envelope, or paste on a postcard—NOW!

J. E. SMITH, Pres., National Radio Institute, Dept. 7NP Washington, D. C.

THIS FREE BOOK HAS HELPED HUNDREDS OF MEN MAKE MORE MONEY



This Coupon is Good for ... One FREE Copy of My Book

J. E. SMITH, President, Dept. 7NP National Radio Institute, Washington, D. C.

Dear Mr. Smith: Without obligating me, send "Rich Rewards in Radio," which points out the spare time and full time opportunities in Radio and explains your 50-50 method of training men at home in spare time to become Radio Experts. (Please Write Plainly.)

NAME.....AGE.....

ADDRESS.....

CITY.....STATE.....

NOW FIX ANY MAKE OF

AUTO**SIX BIG AUTO BOOKS ALL SHIPPED FREE**

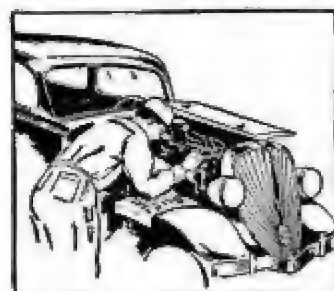
on approval; whether you want to qualify as garage owner, auto repair expert or merely wish to know how to keep your own car 100% efficient, look at these books—they are sent to you for free examination. This brand new edition has been prepared by a large group of America's greatest automotive engineers. Anybody who can read will understand them, for this great automobile encyclopedia is a veritable

gold mine of valuable facts. Take advantage of this offer now: send in the Coupon for FREE examination. You don't pay us a penny, you don't obligate yourself to pay us anything unless you decide to keep the books. Just tell us you want to see them and the full set of 6 great volumes, just off the press, will be sent to you! Read them, look them over and prove to your own satisfaction that one fact alone, which you will find in them, may save you an expensive repair or help you to a better job.

Diesel Engines, Aviation Motors, Outboard Motors, Motorcycles, Tractors, Wiring Diagrams, Equipment Charts, Superchargers, Knee Action and other up-to-date features all included.

Brand New Edition

Imagine books which are so new that every page is right up to date—wiring diagrams, construction details, service problems—are all right up to the minute. Over a million dollars of resources have enabled us to give you the most authoritative books on the subject ever published. Everybody interested in automobiles in any way will welcome these books published by the world's largest publishers of Technical Cyclopedias (est. 1897) with agencies all over the world.

**Can You Fix It?**

Can you take out "play" in differential? Can you kill the "shimmy" in steering? Can you reset TIMING? Can you put your finger on engine trouble without guessing or tinkering? Can you pull the starter off and fix it? Can you adjust and repair transmission, engine, rear axle?

These Books Tell How and tell you how to do any and every auto job right, the first time, and in addition cover Service Shop Management.

6 Big Volumes, Beautifully Bound

Nearly 3,000 pages, over 2,000 illustrations, wiring diagrams, equipment charts, etc. De Luxe edition with gold-stamped flexible binding. Sent FREE for 10 days' use. If not wanted return express collect. If kept, send only \$2.00 after 10 days, then \$3.00 a month until advertising price, \$24.80, is paid.

A Year's Consulting Membership Included

Privilege of consulting engineers of million-dollar American Technical Society on any automotive problem for one year without charge. If you mail coupon immediately. **AMERICAN TECHNICAL SOCIETY**, Drexel at 58th St., Dept. A919, Chicago.

SEND NO MONEY

American Technical Society, Dept. A919
Drexel Ave. at 58th St.
Chicago, Illinois.

I would like to see the brand new 6-volume edition of your automobile books but without any obligation to buy. I will pay the cents delivery charges only and will examine the books and return them at your expense in 10 days unless I like them, in which case I will send you \$2.00 then and only \$3.00 per month until the total price of only \$24.80 is paid. You are to include consulting membership certificate in the American Technical Society. Send Brand New Edition.

Name.....

Street.....

City..... State.....

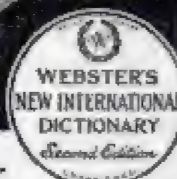
Attach letter stating age, occupation and name and address of employer and that of at least one business man as reference.

Warning!

When You Say "Webster's Dictionary"
You MEAN the MERRIAM-Webster



Accept Nothing Less Than
the "SUPREME Authority"



Look for the Merriam-Webster circular trademark on the cover. The New Second Edition of Webster's New International (unabridged) is 20 years newer, contains 122,000 more entries than any similar dictionary. Provides information in all branches of knowledge. The authority in courts, colleges, newspaper offices. Prepared by 207 of the world's foremost experts. 600,000 entries; 3,350 pages, 12,000 terms illustrated. Ask your bookdealer, or write for free illustrated pamphlet.

G. & C. MERRIAM CO., DEPT. 835, SPRINGFIELD, MASS.



Learn to Write

BEGIN TODAY! Write for our Free Book, "HOW TO BECOME A GOOD PENMAN"

It contains specimens and tells how others learned to write in spare time. Your name beautifully written on a card if you enclose stamp for postage. Over 40 years experience teaching by mail. **WRITE TODAY**

THE TAMBLYN SCHOOL OF PENMANSHIP
411 Ridge Bldg. Kansas City, Mo.

The Tamblin School

RADIO ENGINEERING, broadcasting, aviation and police radio, servicing, marine and Morse telegraphy taught thoroughly. Nine months' engineering course equivalent to three years' college radio work. School established 1874. All expenses low. Catalog free.
Dodge's Institute, Ada St., Valparaiso, Ind.

CARTOONING
PAYS WELL Develop your ability with personal instruction from an internationally-known cartoonist. His exclusive, successful method of drawing and creating ideas makes it easy to attain success. Write for details of this exceptional home-study course.

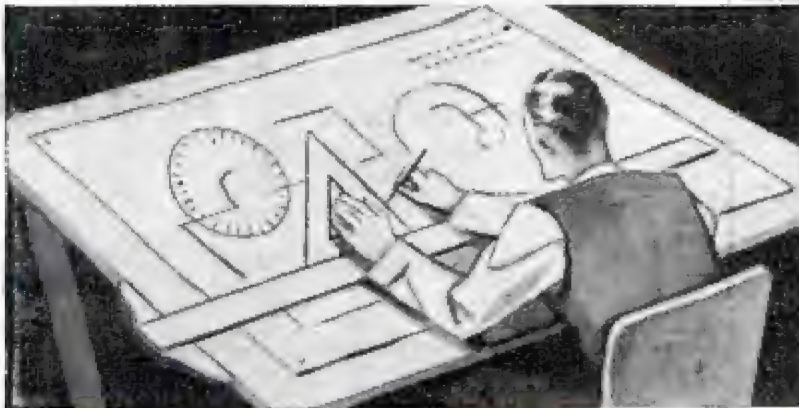
National School of Cartooning, 437 Penton Building, Cleveland, Ohio

**BECOME AN EXPERT PHOTOGRAPHER**

Fascinating hobby or profitable career. Big money-making opportunities. Growing field. We give you individual training. Commercial, News, Portrait, Advertising or Motion Picture Photography. Personal Attendance or Home Study courses. 27th year. Write for Free booklet.

NEW YORK INSTITUTE OF PHOTOGRAPHY
10 West 33 St. (Dept. 49) New York City

LEARN *Practical* **DRAFTING** *at home from an ENGINEER!*



Better jobs being filled daily, and more are expected soon in auto work, electricity, machinery, aviation, and certain building lines for those who learn drafting now! It's the way for a quick start to a better paying, more interesting position. Send at once for Engineer Dobe's FREE Book.

PREPARE FOR *Better* **JOBS**



ENGINEER DOBE
has taught drafting by
mail to thousands of
successful students,
aged 18 to 38 to past 50.
Established since 1900.

As industry revives, who is always needed first of all? The **DRAFTSMAN** who draws the plans. **AFTER** that the steel mills, lumber mills, brickyards and others start getting busy. Recovery in business and most industries now seems well on the way.

Government efforts to help are making things hum. In some factory towns a shortage of draftsmen appears at times. Many trained draftsmen will be needed on better jobs—at better pay and shorter hours. Who'll get those good jobs? Of course, the men who have prepared—so, prepare now!

Drafting Leads Most Industries

Ahead of most any other work is Drafting and Planning for mechanics, builders and factory to produce. It leads them all!

Here Is Your Opportunity!

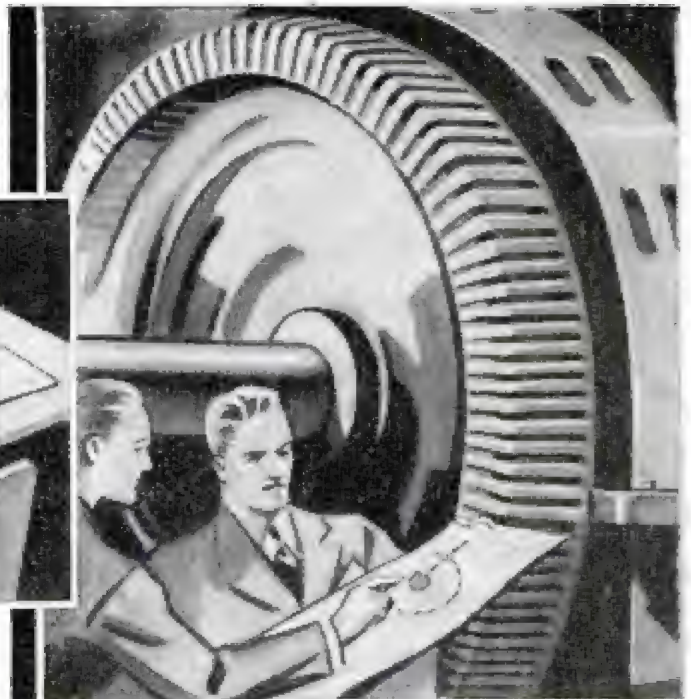
Yes, here is an opportunity that's open to those who know how to grasp it:—At a few dollars a month, students get complete training in drafting by mail in surprisingly few months—Engineer Dobe teaches his students until thoroughly trained and until holding a good paying job. Trained Draftsmen enjoy good salaries. If you don't get a satisfactory job:—all your money back. That's Engineer Dobe's guarantee.

No Experience Required

With Engineer Dobe's method no previous experience is necessary. High School education not needed. Everything made plain. Practical work from the start until you're in position.

Time is money. Learn drafting in your spare time. It's high time now to prepare. Don't wait another day. Send coupon for Dobe's free book.

ENGINEER DOBE Div. 3379
Libertyville, Ill.



YOU'LL EARN *Better* **PAY!**

Start NOW

Win PROMOTION—DRAFTING

If you're a mechanic, a knowledge of draftsmanship may make you a foreman or superintendent in short order. Get out of overalls and draw the pay of a boss. If you are a boss, learn draftsmanship, a foundation stone of many a line of business.

In every walk of life, practical training in draftsmanship will prove valuable. Even if you never accept a job as a draftsman, will you not be *money ahead* by taking Engineer Dobe's course?

You'll be amazed at the speed with which you can learn in your spare time by Engineer Dobe's Practical Method. Send coupon TODAY for free book entitled "Success in Draftsmanship".

All Working Tools Furnished

Here's a valuable set
of tools—sent at once
(also a drawing table)
—all without extra
charge the day
you enroll.

Complete Outfit,
size 20x25 in.,
furnished
to you.

**These TOOLS and Other
EQUIPMENT**
Given When You Start

Free Book!

ENGINEER DOBE, Div. 3379 Libertyville, Ill.

Send me your free book "Successful Draftsmanship". Please explain how you assist your graduates to good positions as draftsmen.

Name

Address

Town

State.....Age

When writing to advertisers please mention Popular Mechanics



High School Course at Home

Many Finish in 2 Years

You can complete this simplified High School Course as rapidly as your time and abilities permit. Equivalent to resident school work—prepares you for entrance to college. Standard H. S. texts supplied—Diploma. Credit for H. S. subjects already completed. Single subjects if desired. High School education is very important for advancement in business and industry and socially.

College Entrance

During the past 14 years, our High School graduates have been admitted to 531 different Universities, Colleges, Junior Colleges and Normal Schools—80% of them without entrance examination. Course also prepares for teachers' certificate and pre-professional examinations.

Business—Industry

To get and hold a good position in Business today you must be able to write clear, accurate letters and reports—do figuring involving Algebra and Geometry—talk intelligently on matters requiring a knowledge of Geography, History, and Economics.

In Industry—Mechanical and Engineering lines—you must have at least an elementary knowledge of Physics and Chemistry—be able to figure quickly and accurately—know something of Mechanical Drawing and blueprints—and be able to talk and write accurately and clearly on both your work and ordinary topics of conversation.

Our High School course meets the preparatory educational requirements for Business and Industry.

An Educational Institution

The American School was chartered in 1897 as an educational institution, not for profit—and is exempt from paying Federal income tax, like the best resident colleges and universities.

Don't Be Handicapped— Complete Your Training Now

Be a High School Graduate! Prepare yourself for promotion in Business and Industry—for the Professions, College Entrance and social success. No matter what line you may select, High School training will prove invaluable to you!

20 Other Courses

Over 150 noted Educators, Engineers, and Business Men helped prepare our special instruction material, which is used by many resident schools and colleges, U. S. Navy, and Province of Manitoba, Canada. We offer you quality training at home for the best-paying lines of Industry and Business, as listed in the coupon.

Our moderate fees cover all instruction, standard textbooks and Diploma. Easy monthly terms. Get ahead in life. Start your training NOW!

Mail coupon for information about line that interests you
American School, Drexel at 58th, Chicago

American School, Dept. M945, Drexel at 58th, Chicago
Tell me how to train for success in line checked. No obligation.

- | | |
|--|--|
| <input type="checkbox"/> Accounting & Auditing | <input type="checkbox"/> Diesel Engineering |
| <input type="checkbox"/> Architecture & B'ldg | <input type="checkbox"/> Drafting & Design |
| <input type="checkbox"/> Automotive Engin'ring | <input type="checkbox"/> Liberal Arts |
| <input type="checkbox"/> Business Management | <input type="checkbox"/> Private Secretary |
| <input type="checkbox"/> Commercial Aeronautics | <input type="checkbox"/> H'ier Ac't'g (C.P.A.) |
| <input type="checkbox"/> Electrical Engineering | <input type="checkbox"/> Highway Engin'g |
| <input type="checkbox"/> Electrical Refrigerat'n | <input type="checkbox"/> Mechanical Eng'r'g |
| <input type="checkbox"/> Air Conditioning | <input type="checkbox"/> Radio & Television |
| <input type="checkbox"/> Civil Engineering | <input type="checkbox"/> Salesmanship |
| <input type="checkbox"/> Complete Law | <input type="checkbox"/> Steam Engineering |

Name.....
Address.....

EASIEST

to master, assuring fast progress and finest musicianship, the Buescher True Tone trumpet has advanced improvements that almost guarantee your success. The last word in fine tone, intonation, and action. Join a band, have loads of fun, be the center of everything with a Buescher.

TOMMY WALKER, now California's boy wonder, owing to fame with his Buescher.

FREE TRIAL, easy payments; any instrument, sax, trumpet, trombone, etc. See your music dealer or write for beautiful free book, mentioning instrument that interests you. Get details of home trial. No obligation. Write today. 22

Buescher Band Instrument Co.
1214 Buescher Bldg., Elkhart, Ind.



ENGINEERING

DEGREE
IN TWO
YEARS

TECHNICAL AND APPLIED COURSES. Nonesensicals omitted. TIME AND MONEY SAVED. Degree 2 yrs., diploma 1 yr. Electrical, Mechanical, Architectural, Structural, Civil, Aeronautical, Highway. All courses include Air Conditioning, Electric Refrigeration and Diesel. Short intensive courses 3 and 4 months in Electricity, Power Plant, Diesel-Electric, Air Conditioning, Electric Refrigeration, Drafting. Extensive modern equipment. LOW TUITION. Part-time work for room and board. Thousands of successful graduates in U. S. and foreign lands. Approved by industry, endorsed by educators, recommended by alumni. One and two-year courses open in Sept., short courses open year round. 38th YEAR. Catalog free.

FINLAY ENGINEERING COLLEGE

1001 Indiana Avenue

Kansas City, Mo.

BE A RAILWAY TRAFFIC INSPECTOR

Make Good with this Special Training

MEN—19 to 35—trained as Railway and Bus Passenger Traffic Inspectors earn good pay to start and advance quickly with experience. Simple home-study course qualifies you and upon completion, we help place you at up to \$200 per month, plus expenses to start, or refund tuition. 10 years' experience. Free Brochure. STANDARD BUSINESS TRAINING INSTITUTE, Div. 212, Buffalo, N. Y.

FLY WITH THE DAWN PATROL

Government Approved. Unequaled advantages in location, equipment, type training for obtaining License Transport, Limited Commercial, Private Flying, Sheet Metal, Radio, Mechanical. For Complete Illustrated Catalog.

SPARTAN SCHOOL OF AVIATION, J.D. Green, Director, Dept. PM1, Tulsa, Okla.

GOV'T. JOBS

Thousands of openings yearly. Men-Women, age 18-50 Start \$105-\$175 month. Get ready now for next entrance test. Get our new plan—mailed FREE. Write, OZMENT INSTRUCTION SERVICE, Dept. 111, St. Louis, Mo.

Learn Radio in 12 WEEKS

I WILL
FINANCE YOUR TRAINING

IF YOU ARE SHORT OF MONEY

Prepare for jobs in Radio Broadcast, Talking Pictures, Television by 12 weeks of practical shop work in the great

Coyne Radio Shops, on real RADIO and Sound equipment. You don't need advanced education or experience. Free Employment Service for life. Many earn while learning. Electric Refrigeration—Air Conditioning included. MAIL COUPON TODAY for free book which tells you how hundreds have become successful Radio Men after taking our training.

H. C. LEWIS, Pres., COYNE ELECTRICAL & RADIO SCHOOL
500 S. Paulina Street, Dept. 97-3H, Chicago, Illinois

Send Free Radio Book and facts. Tell me about your "Pay-Tuition-After-Graduation" Plan.

NAME.....AGE.....
ADDRESS.....
TOWN.....STATE.....

Look Up Young Man!

LOOK UP!

Read your future in the skies. Look beyond the winged fleets above . . . into the great plants where they are built. In those plants—creating today's planes—are men of trained hands and trained minds.

Perhaps you can start YOUR career as one of these skilled craftsmen. It takes certain rigid qualifications—but you may possess them. It takes highly specialized training—but that is easy to obtain.

at Aero I.T.I.

you will find an institution operated exclusively to provide worthy men with this special training. Four modern new buildings on a five-acre campus . . . a complete assemblage of the most advanced aircraft plant equipment, put at your command the finest training facilities in existence.

You learn actual airplane production technique—the whole training system places you under the supervision of the aircraft leaders on the Aero I.T.I. Executive Board.

EXECUTIVE BOARD

ROBERT E. GROSS, President, Lockheed Aircraft Corporation
JOHN K. NORTHROP, President, The Northrop Corporation
C. A. VAN DUSEN, Vice President, Consolidated Aircraft Corp.

If you have the vision to picture YOUR future in aviation's great future, Aero I.T.I. training is the kind of preparation you will want. You will have the tremendous advantage of training in Southern California—the world's greatest center of aviation activity.

For complete information, get the FREE booklet, "More Planes." Find out about Aero I.T.I. resident courses . . . also the combination course, with theory at home and later shop training.

Send the Coupon Now!



5253 West San Fernando Road
Los Angeles,
California

AERO INDUSTRIES TECHNICAL INSTITUTE, Inc.
5253 W. San Fernando Road, Los Angeles, Calif.

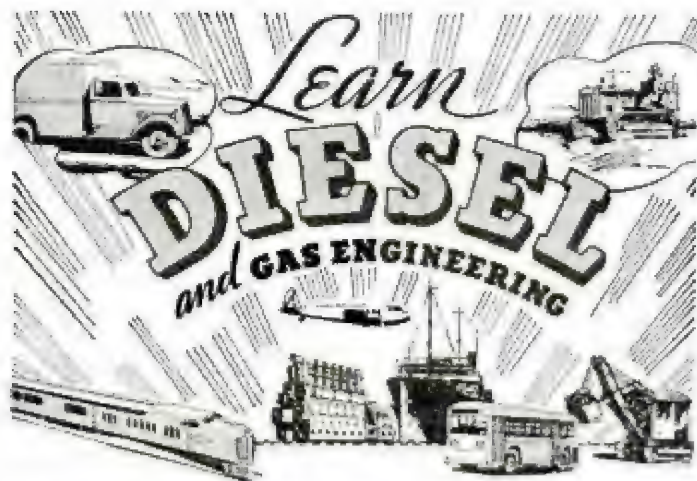
Please send free booklet, "More Planes." I am 18 years of age or over and can furnish character references.

Name..... Age.....

Street Address..... State..... a-4-p

City.....

NO MATTER WHERE YOU LIVE there is a plan whereby you may START YOUR TRAINING NOW



TESTED SYSTEM OF DIESEL AND GAS ENGINE TRAINING

To qualify for a good Diesel job you must receive training in an institution that can offer you **practical** instruction. At National Schools you actually work on the latest equipment, including practically every approved make of Diesel engine. You get the kind of instruction that serves your every day needs in the Diesel field after you have graduated. It's the type of training you can "cash in" on. You are trained under the direct, personal supervision of licensed Diesel Engineers.

DIESEL ELECTRIC POWER GENERATION

A new feature essential to the complete training of Diesel experts. Completely covers power generation. This extra course is now presented to all Diesel students without extra tuition.

EASY-TO-LEARN MASTER TRAINING

National Schools' training is complete in every respect. It includes all phases of Diesel engines, fuel injection, gasoline, butane, propane and natural gas engines, also Auto-Diesel electrics, machine shop practice, batteries and other essentials that must be learned in order to give you well rounded-out training.

LEARN IN LOS ANGELES

The most delightful place to learn—Los Angeles—the playground of America. Fascinating surroundings. Your coach railroad fare will be allowed to Los Angeles from any point in the U. S.

EARN ROOM AND BOARD

We help students obtain part-time jobs to earn room and board while learning. This service only for residents of U. S.



NATIONAL SCHOOLS
Los Angeles

FREE BOOK

MAIL THIS COUPON

NATIONAL SCHOOLS, Dept. 12-PMA,
4000 So. Figueroa St., Los Angeles

NAME.....AGE.....

ADDRESS.....

CITY.....STATE.....

When writing to advertisers please mention Popular Mechanics

Accounting ... a well paid position in which you are Not Old at 40

Only a step up from clerk to Bookkeeper—from bookkeeper to Accountant, who at 40 is just coming into his prime—with 15 to 25 years' real earning power ahead. Our course based on standard texts used by many Colleges and Universities. Prepares for Business and C. P. A. ● **FREE** 32-page booklet explains WHY the Accountant is well paid—has steady work—is in line for promotion—and, best of all, why he is NOT old at 40. Write TODAY. No obligation.

American School, Dept. PA-945, Drexel at 58th, Chicago

RADIO ENGINEERING



RCA Institutes offer an intensive course of high standard embracing all phases of Radio. Practical training with modern equipment at New York and Chicago schools. Also specialized courses and Home Study Courses under "No obligation" plan. Catalog Dept. PC-37.

RCA INSTITUTES, Inc.

A Radio Corporation of America Service

75 Varick St., New York 1154 Merchandise Mart, Chicago

LEARN WATCH REPAIRING



AT HOME You can learn by our modern and original system of instruction every part of the Watch Repairing Trade at home. You can earn money while learning and prepare yourself for a well paying position or start in business after completing our course of instruction. Good watch repairers are in demand and generally earn very good salaries. For particulars apply to the Wisconsin School of Watch Repairing 524 E. Mason St., MILWAUKEE, WIS.

ANY BOOK IN PRINT!



Delivered at your door. **We pay postage.** Standard authors, new books, popular editions, fiction, reference, medical, mechanical, children's books, etc.—**all at guaranteed savings.** Send card now for Clarkson's 1938 Catalog.

FREE Write for our great illustrated book catalog. A short course in literature. The buying guide of 200,000 book lovers. The answer to your Christmas gift problem. **FREE** if you write NOW—TODAY!

CLARKSON PUBLISHING COMPANY

Dept. G—1253 S. Wabash Ave., Chicago, Illinois

AVIATION APPRENTICES



Ambitious, air-minded young men, interested in entering the well paid field of Aviation, write immediately, enclosing stamp, to

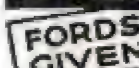
Mechanix Universal Aviation Service, Incorporated
Dept. E
Strathmoor Station
Detroit, Mich.

LEARN CARTOONING

by the method that has developed hundreds successfully. Send name, address and age for free chart to test your ability.

THE LONDON SCHOOL, 1737 National Bldg., Cleveland, Ohio

I WANT MEN



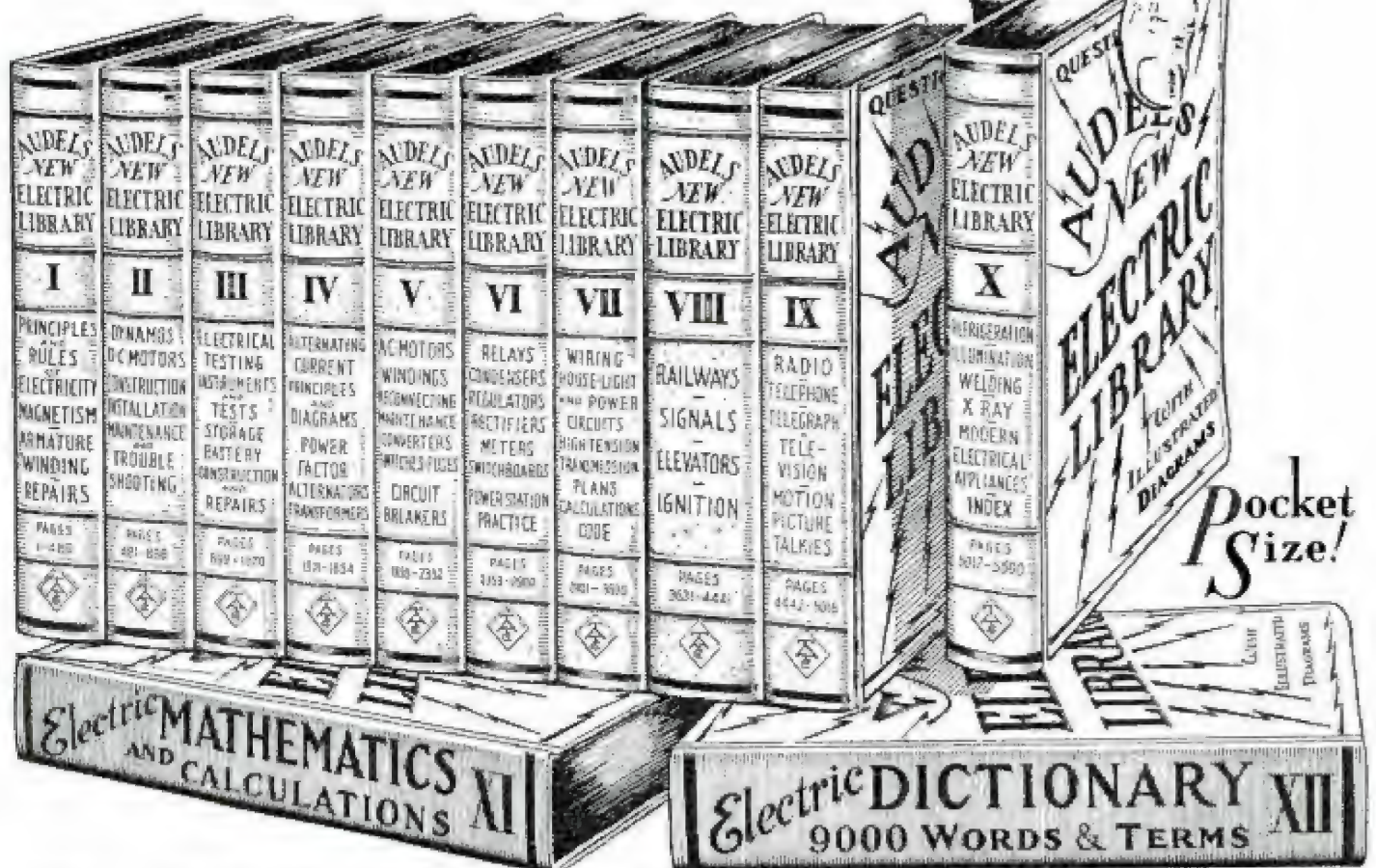
FORDS GIVEN TEA AND COFFEE ROUTES PAYING UP TO \$60 IN A WEEK. National company needs more men at once to make regular calls on local routes. No experience needed. Operate on our capital. I give producers brand-new Ford cars as bonus. Rush name on postcard for **FREE** facts.

ALBERT MILLS

4285 Menomoth, Cincinnati, Ohio

NEW ELECTRIC LIBRARY

\$ 1.50 A VOLUME



AUDEL'S NEW ELECTRIC LIBRARY

THE 12 volumes are now complete with 7,200 pages—9,500 illustrations—gold titles and edges—red, flexible covers—pocket size—5½x6 inches—sold separately at \$1.50 a volume postpaid—money back if not pleased.

THIS IS YOUR OPPORTUNITY

EVERY electrician, every engineer, every mechanic, every student, should know about these new helpful books which give in plain words, including questions and answers, a complete working knowledge of electrical engineering in all phases.

HOME STUDY BOOKS

AUDEL'S New Electric Library is arranged as a progressive home study course in Electricity. It will give anyone who will devote 15 to 30 minutes a day to its study, a scientific and working knowledge of Electricity in all branches. Written in plain language, the clear illustrations are easy to understand. They make study and learning a pleasure.

VALUABLE REFERENCE BOOKS

YOU ask the questions—Audel's New Electric Library will give you the answer. You

will be surprised how easy it is to learn Electricity the Audel way. The 9,500 simplified outline cuts and graphic pictures are concise explanations of the theories and applications of applied Electricity with useful information relating to the construction, operation and maintenance of machines.

EASY TO READ FOR PROFIT

THESE books are helping thousands of men by giving them a broader view of the whole field of Electricity, without which a man is often handicapped. Send for a single volume, any one of the Series, at our risk.

AUDEL'S BOOK A MONTH PLAN

THE first book is sent to you on 7 days' free trial. If you find it will help, send the price; if not mail it back. The second book is sent on receipt of payment for first book and we allow you 30 days to pay for each following book. Following numbers are mailed after payments have been received until you have completed the Series. If not satisfied, you may cancel your subscription at any time. Mail order to-day and you will have taken your first step on the Road to Success. Start subscription with any volume.

MAIL EXAMINATION COUPON

Theo. Audel & Co., 35 W. 23rd St.
New York City, N. Y.

Please enter my subscription for Audel's New Electric Library. Price \$1.50 a volume. Mail one volume each month, for which I will remit \$1.50 promptly after arrival. Start my subscription with Volume _____

Name _____

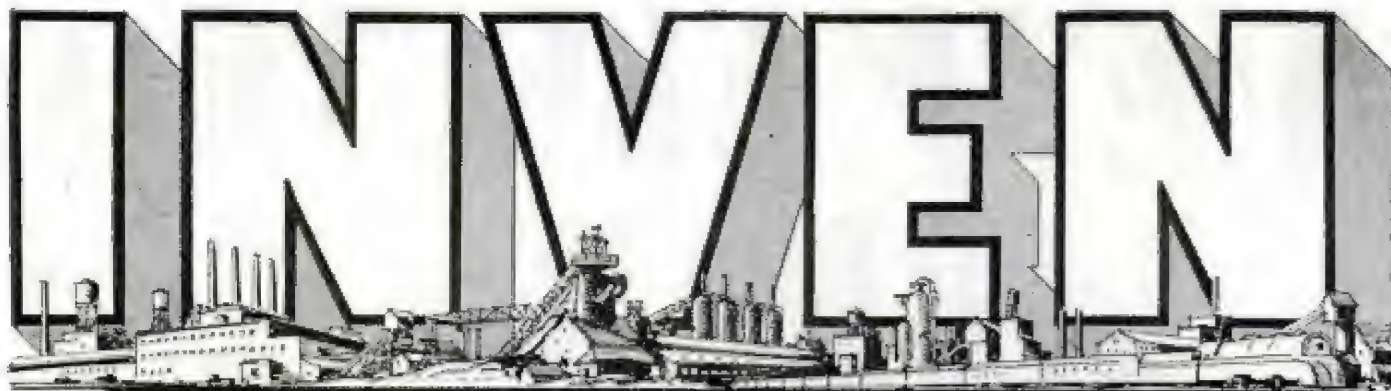
Address _____

Occupation _____

Employed by _____

THEO. AUDEL & CO., 49 W. 23RD ST., NEW YORK CITY

When writing to advertisers please mention Popular Mechanics



How to Determine The Patentability Of Your Invention

Before you spend money in making a model, or spend weeks in its design, we advise you first to have a preliminary search made through U. S. Patents in the U. S. Patent Office to see if there are inventions like yours already on record; and, if so, let us give you our opinion as to the patentability of what you have.

We employ experienced searchers to perform this service for you. From the reports of our searchers we can quickly form our opinion as to whether your invention is confronted with obstacles in the form of already granted patents. First get our FREE BOOK and read the chapter on "How Can I Know Whether My Idea is Patentable?"

HOW WE SERVE THE INVENTOR

We have secured patents for inventors located in every state in the Union. Our organization is a large and efficient one. Our practice is confined entirely to Patents, Trade-Marks, and Copyrights. We have had years of experience in Patent Matters. When you place your invention in our hands, we are in position to proceed at once to secure protection for you.

Learn How To Get Your
THIS FREE BOOK
FROM THE CRUDE INVENTOR'S SKETCH TO THE

Our fees are reasonable, and, if you desire, we can arrange convenient terms of payment.

WHAT HELP IS THE PATENT ATTORNEY?

Your invention may provide your life's greatest opportunity. If it is to bring income to you it should be legally yours. Upon your patent attorney's skill rests how completely your patent covers all the protectable points in your invention. The inventor may actually lose money on his invention by overlooking a single claimable point that a skilled patent attorney would not miss.

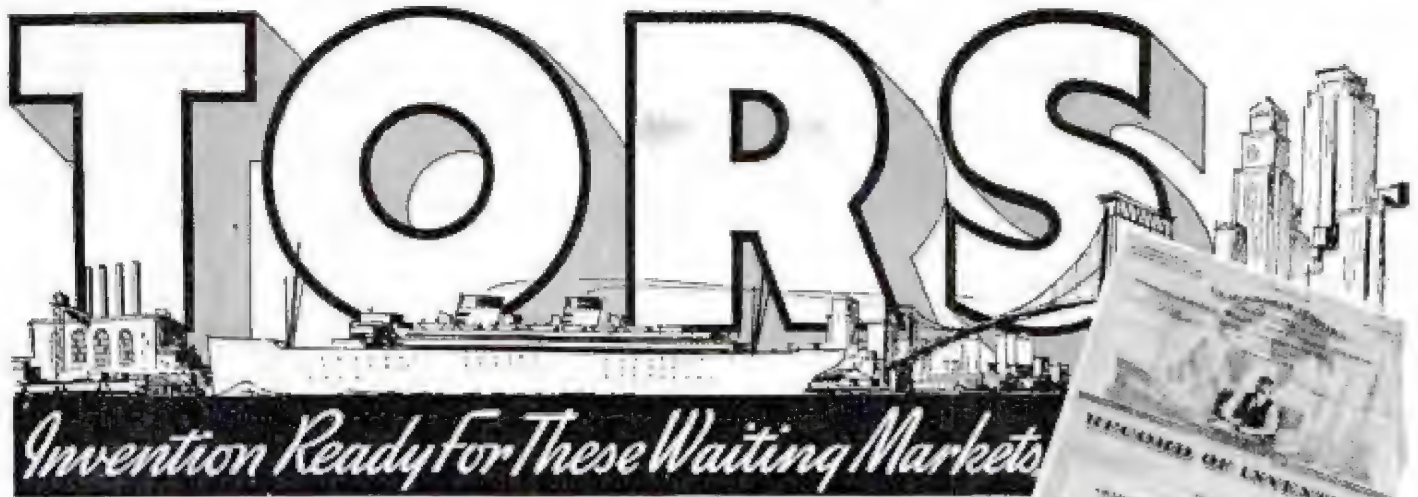
WHAT THE INVENTOR MUST KNOW

In order to proceed successfully, the inventor must follow certain definite steps that precedent has established as the quickest way to reach his goal. Our FREE BOOK, "Patent Guide for the Inventor," gives a concrete, logical, and thorough resume for the inventor to follow. It takes him, through 48 pages, from the crude first model to the finished commercial product. It shows the inventor how to avoid mistakes, how to shorten the road in getting his invention ready for market; it also points out how to save money and avoid the errors of inexperience in applying for patent. Getting our FREE BOOK should be the first step in definitely declaring yourself an inventor. After you get this illustrated, clearly worded guide of carefully compiled patent knowledge you will know how to proceed without expensive mistakes and discouraging setbacks from "wrong-track" methods.

CLARENCE A. O'BRIEN & HYMAN BERMAN

70-B ADAMS BUILDING, WASHINGTON, D. C.
Registered Patent Attorneys before U. S. Patent Office

When writing to advertisers please mention Popular Mechanics



Keen competition in every form of industry has put manufacturers feverishly at work trying to speed up output, reduce overhead, save on materials, outsell trade opponents. The inventor is the key-man in making advancement possible to any business. Upon the inventor rests the success of many enterprises.

This does not mean that you must have something gigantic to win commercial success.

A new way to open a door or button up a shirt may be the very thing hundreds of manufacturers are looking for. If you have something novel—if it is practical to manufacture—no matter whether it be an improved rattle for a child or a whistle for a mechanical automobile, there is likely a waiting market.

FREE RECORD OF INVENTION FORM.

This FREE Record of Invention Form enables you to make in convenient form a sketch of your invention and have it witnessed in a manner of value to you should the occasion for evidence arise. MAIL THE COUPON TODAY and obtain our FREE BOOK and Record of Invention Form.



THE IMPORTANCE OF IMMEDIATE ACTION

In making application for patent it is important to be first. Even if your application is delayed by a few days you may be placed at a disadvantage. The short time that elapsed between Elisha Gray's application for his telephone patent and the application of Alexander Graham Bell probably cost Gray the rights to the telephone.

**TEAR OFF
AND
MAIL
NOW!**

COUPON

CLARENCE A. O'BRIEN and HYMAN BERMAN

70-B Adams Building
WASHINGTON, D. C.

Registered Patent Attorneys
Before U. S. Patent Office

Please send me at once your Big FREE 48-Page Book, "Patent Guide for the Inventor" and your Specially Prepared "Record of Invention" form. This request does not obligate me.

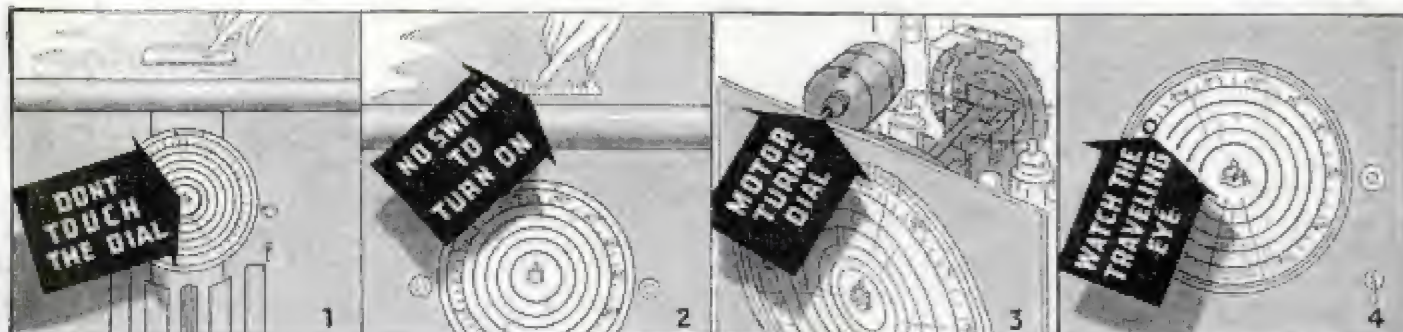
NAME.....

ADDRESS.....

(Please write or print plainly)

JUST TOUCH A LATEST 20-TUBE MIDWEST TUNES ITSELF BY ELECTRIC MOTOR!

**YOU DON'T EVEN HAVE TO TURN THE SET ON OR
HANDLE ANY CONTROLS. IT DOES EVERYTHING ITSELF
... IT'S THE ONLY RADIO LIKE IT IN THE WHOLE WORLD!**



**MIDWEST FACTORY-
TO-YOU SAVES 50%**

only \$49⁹⁵
LESS TUBES
NEW LOW

BASE PRICE CHASSIS

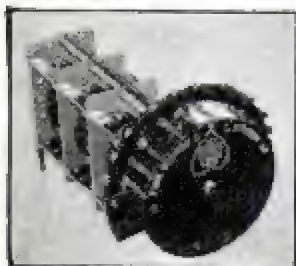
**30
DAYS
FREE
TRIAL**

**TERMS
AS LOW AS
50¢
A WEEK**

Just One of 101 Features

This amazing "Phantom Hand" interprets your touch-button orders, transmits them to the electrical motor and supervises it until the station comes in perfectly tuned at the exact center of resonance!

Do not confuse Midwest "Instant" Motorized Tuning with ordinary so-called "Touch-Button" radios that require 5 to 5 times as long to tune... on which you have to turn switches and controls. You don't even have to turn the Midwest on, or handle any controls... it does everything itself.



Dept. HH-15, MIDWEST RADIO CORPORATION, CINCINNATI, OHIO, U. S. A.

When writing to advertisers please mention Popular Mechanics

BUTTON...



FLASH!

Here's today's biggest radio news—Midwest and only Midwest gives you a combination of Mystic Movie Dial, Traveling Coloray Eye, Phantom Hand and Motorized Tuning! Just touch a button on top of the radio . . . that's all . . . and FLASH! . . . your station comes in perfectly tuned, in one second . . . just like magic . . . at the exact center of resonance. (You can also tune by hand whenever you desire.)

The famous Midwest factory-to-you plan, proven by 18 years of success, is just as exciting. It enables you to buy at wholesale prices . . . to save up to 50% . . . to make your radio dollar go twice as far . . . and to pay as little as 50 cents a week on the Midwest Easy Pay Plan.

Even More Glorious Tone

When you tune in a domestic or foreign program on this super 20-tube 6-wave band 12,000 mile-range Motorized Midwest, you hear it with a new clarity, new depth and an intensity of feeling. Glorious, crystal-clear concert realism and brilliant for-

ign reception are now realities. Super power and 101 advanced features enable you to bring in weak distant foreign stations like "locals". Now delight in American, Canadian, Police, Amateur, Airplane, ship broadcasts . . . and finest foreign programs.

Take Advantage of This FREE Trial Offer

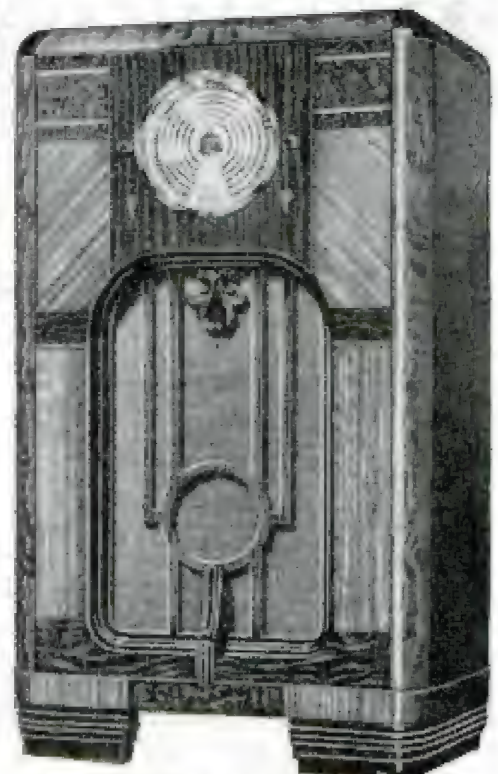
Act at once on this unusual factory-to-you offer. We send any Midwest radio you desire to your home. You use it 30 days, and compare it with other radios you have owned or heard. You are triply protected with Foreign Reception Guarantee, One-Year Warranty and Money-Back Guarantee.

[SERVICE MEN: Join nation-wide Midwest service organization. Write for free details.]

MIDWEST *factory-to-you* RADIOS

DEPT. H-14-15 MIDWEST RADIO CORPORATION...CINCINNATI, OHIO, U.S.A.
Manufacturers of Quality Radios Since 1920

When writing to advertisers please mention Popular Mechanics



**SEND FOR
FREE
1938 CATALOG**



PASTE COUPON ON 1" POSTCARD...OR WRITE TODAY!

MIDWEST RADIO CORPORATION

Dept. H-14-15 Cincinnati, O.

Send me your new 1938 catalog and complete details of your liberal 30-day FREE trial offer. (Special offer and prices prevail only when dealing direct with factory by mail.)

Name

Address

Town

State

User-Agents Make Easy Extra Money. Check Here ☐ for details
☐ Check Here for 1938 BATTERY catalog

*be an
early
bird*



IN
**AIR CONDITIONING
and Refrigeration**

● Get started NOW in the new but already booming Air Conditioning and Refrigeration industry. Get started NOW while there are far more jobs than trained men to fill them . . . while the field is wide open for quick jumps to important posts . . . while there is plenty of room at the top.

● HOW to get started? It takes training such as you get in Thermo Institute courses. Home-and-shop or resident study gives you all the theory and principles . . . plus actual practice on the very equipment that you'll build, sell, install, operate, or service after you graduate.

● The "early birds" are getting this training NOW. Do you have the vision and plain "get-up" to be among the first in this rising industry? Prove it . . . send the coupon!

FIND OUT what awaits the "Early Bird!"
Get this **FREE 16-page book**
"The Air You Breathe"

THERMO **AIR CONDITIONING INSTITUTE, Inc.**

A nation-wide institution with complete schools, laboratories, and employment offices in

LOS ANGELES 182 So. Alvarado Street
NEW YORK 1755-A Broadway
CHICAGO 125-A W. Hubbard Street

• Training Worthy of the Industry •

Please send free book and complete information on Thermo Institute courses.

Name Age

Address

City State t-5-p

DO YOU KNOW that Air Conditioning is Expected to Lead the Coming Boom?

WANTED: TRAINED PILOTS and MECHANICS *for BIG PAY JOBS* **IN AVIATION**

Prepare Yourself at Lincoln for a Big Pay Job in Aviation. Exceptional opportunities for trained men. Airline Pilots earn up to \$700 a month; Mechanics up to \$200 a month. Millions of miles added to airline schedules—Hundreds of Million Dollars being spent this year on new airplanes. Lincoln Government Approved Flight Training prepares you for any Pilot's License including Transport. Lincoln Government Approved Mechanics Training prepares you for Mechanic's License. 14 MODERN TRAINING PLANES. Lincoln has 13 laboratories and shops with large assortment of airplanes and engines for practical experience. Government Licensed Instructors. Lincoln Graduates in good demand. We assist graduates in locating positions. Write now for complete information. State age.

LINCOLN AIRPLANE & FLYING SCHOOL
203-H Aircraft Bldg. Lincoln, Nebr.

Be a DENTICIAN



Learn at home to make Crowns, Plates, Bridgework, etc., for Dentists. Easy, practical way to learn mechanical dentistry at home in spare time. Full Equipment of Tools and Materials Included with Course. Low tuition. Easy terms. Write for FREE BOOK about this money-making profession that is not affected by "machine age."

**McCARRIE SCHOOL
OF MECHANICAL DENTISTRY**
207 No. Broad St., Dept. 728, Philadelphia, Pa.

ELECTRICAL ENGINEERING

For those who can't afford the time and expense of a 4-year college course, Bliss offers a condensed ONE YEAR residence training, combining essential Theory and Practice. 45th year. CATALOG ON REQUEST!



**BLISS ELECTRICAL
SCHOOL**

122 Takoma Ave., Washington, D. C.

HOW TO INVENT 13 Booklets In Two Loose Leaf Binders

The Newest Edition of our Regular Course
for sale while they last at **\$11.00 per set**
Only a few sets available—

Send your order with remittance TODAY

TROFIMOV SCHOOL of INVENTIVE PRACTICE
3559 Northampton Road Cleveland Heights, Ohio

MAKE MONEY

with your **CAMERA**
Thousands of publications buy MILLIONS of photos yearly from amateurs. We show you what to photograph, how to do it, where to sell for big profits. Learn at home. You may pay for course in small monthly installments. Write for FREE BOOK.
UNIVERSAL PHOTOGRAPHERS,
Inc., Dept. 712, 10 West 33rd St., New York, N. Y.

BARBERING OR BEAUTY CULTURE OLDEST, LARGEST SCHOOLS. Est. 1893. EARN while LEARNING. Day, Night classes. Free National employment bureau. Prize winning teachers. Big pay. Professions. Low rates. Easy terms. Free booklet "B."
MOLER SYSTEM, NEW YORK, N. Y., 303 Fourth Ave.

★ **GUITAR** ★

Gibson **88 PAGE CATALOG**
WRITE FOR A COPY TODAY!

GIBSON, INC., Dept. B • Kalamazoo, Mich.

DRAW me!

TRY FOR AN *Art Scholarship*

Copy this girl and send us your drawing — perhaps you'll win a **COMPLETE FEDERAL COURSE FREE!** This contest is for amateurs, so if you like to draw do not hesitate to enter.

**Prizes for Five Best Drawings —
FIVE COMPLETE ART COURSES
FREE, including drawing outfits.
(Value of each course, \$215.00.)**

FREE! Each contestant whose drawing shows sufficient merit will receive a grading and advice as to whether he or she has, in our estimation, artistic talent worth developing.

Nowadays design and color play an important part in the sale of almost everything. Therefore the artist, who designs merchandise or illustrates advertising has become a real factor in modern industry. Machines can never displace him. Many Federal students, both men and girls who are now commercial designers or illustrators capable of earning \$1000 to \$5000 yearly have been trained by the Federal Course. Here's a splendid opportunity to test your talent. Read the rules and send your drawing to the address below.



RULES

This contest open only to amateurs, 16 years old or more. Professional commercial artists and Federal students are not eligible.

1. Make drawing of girl 6½ inches high, on paper 7 inches square. Draw only the girl, no lettering.

2. Use only pencil or pen.

3. We return no drawings.

4. Print your name, address, age, occupation on back of drawing.

5. All drawings must be received by November 26th, 1937. Prizes will be awarded for drawings best in proportion and neatness by Federal Schools Faculty.

FEDERAL SCHOOLS • INC

Dept. 12137, Federal Schools Building, Minneapolis, Minnesota

A frank man to PATENTS-INVENTIONS

THE world of invention moves on. About a hundred years ago people were saying, "There's nothing left to invent"—today we know that is one of the funniest things ever said. Just think what has happened in the last hundred years! Autos, radios, airplanes, and thousands of useful, practical devices for home, shop and office have been invented and put on the market. Inventors are constantly making the world a better place to live in. Did you see a notice in the paper that an obscure worker, Hans Wach, has invented a simple device to utilize exhaust steam on steam boats? *Already, the report states, the steamship lines have saved more than \$15,000,000 in fuel bills with his invention.* Almost in the same breath the Dept. of Commerce announced that it will soon test out a new, non-crashable aeroplane, which the average man can learn to fly in a day, which will travel at 110 miles an hour and sell at the price of a cheap automobile. An unknown Seattle man has invented a robot to go 5,000 feet under the sea and recover millions and millions of dollars worth of gold lying at the bottom of the ocean since the days of the early Spaniards.

Remember this: For every outstanding big invention there are thousands of small, simple things for use in the home, the office, the factory, on the farm, on every sort of travel conveyance. Little articles like you find on the counters of a 10-cent store, hardware store, drug store, toy and novelty shop.

Many Little Ideas Have Big Commercial Possibilities

A person finds something he's using doesn't work right, or it's clumsy, or costs too much. He gets a happy thought. He improves the old Article. That's contribution to human progress. That's the way that many, many men have reached the goal of financial comfort, independence and even wealth. Most of the things millions of us use didn't come from the brains of engineers and physicists. They came from the mind and maybe the crude home work bench of Mr. Average Man, busily engaged in earning his bread and butter at whatever chance or circumstance has given him to do. The "little" man's opportunity as an inventor was never greater than it is today.

Who Are Inventors?

You'd be amazed at the men we contact in the course of a busy year. Most of them do not consider themselves inventors at all. During their work or leisure they get an idea. They work it out on paper. They get in touch with us about

Protection. Did you know that a dentist invented the stock ticker, a school teacher the telephone, a farmer the typewriter, an artist the telegraph? Did you know that the crinkly hair pin—sold by millions now—came about because a husband saw his wife twisting the old-fashioned straight hair pin to make it stay in place? **Poor men who have no thought of invention now will be financially well-fixed in a few years because of a happy thought that the world could use to advantage.**



Can You Answer These Questions?

Ask yourself these questions: How do the Patent Laws protect me? What easy steps can I take, without cost, to put myself in position to support my belief that I am the first man to think of **my invention**? Is a Patent worth the cost? Do I need a model? Should I try to sell my invention before I have it Patented? Is there any safe, business-like way to secure financial help? If I do apply for a Patent, how shall I reach people who

can market my invention? Can I protect and sell an improvement on some invention that has already been patented? These are but a few of the questions which usually confront the average man. You need the answers! **YOU CAN HAVE THEM**, without cost, trouble, or delay.

Our Business Is to Help You. Write Us Today

For more than thirty-seven years, this firm has been helping men with an inventive turn of mind. We maintain a large staff of trained, experienced specialists—Registered Patent Attorneys, Draftsmen, and Searchers to help our clients secure all the protection to which they are entitled. Fees are reasonable. Deferred payments frequently arranged. Questions promptly answered. Write us frankly with absolute assurance that what you say will be treated with strictest secrecy. **BUT FIRST, send for the FREE BOOKS shown on the opposite page.** They are filled with facts, pictures and suggestions. They tell you things about Patents, Inventions and Selling Inventions that we have learned in our long experience. They may save you time, expense, **EVEN LATER DISAPPOINTMENT.** Simply fill in the coupon. No charge, no obligation. Write us **TODAY.**

Copyright 1937, Victor J. Evans & Co.

RUSH COUPON TO WASHINGTON, D.C. TODAY

man talk about - SELLING INVENTIONS

115 Mechanical Move- ments Like These

Besides many other features and facts there are 115 different mechanical movements and principles in the big 48-page Book below. Maybe there is just the idea you need to solve some mechanical problem. Use the coupon or write us a card or letter.

2 FREE BOOKS
with
68 PAGES
of Facts and Pictures!

PATENT PROTECTION A BOOK FOR INVENTORS

Suggestions
on
WHEN
and
HOW
to Sell an
INVENTION

NEW BOOK About Selling INVENTIONS

So far as we know, the facts in this booklet have never before been published by any Patent Attorney. You are given very definite suggestions on "When and How to Sell an Invention." It also comes to you **FREE.**

VICTOR J.
EVANS & Co.

REGISTERED PATENT ATTORNEYS

Main Office: 200-P, Victor Building,
Washington, D. C.

Other Offices: 2610-N, Singer Bldg., New York
1445-N, Monadnock Bldg., Chicago
1010-N, Hobart Bldg., San Francisco
405-N, Garfield Bldg., Los Angeles

Send me **FREE** copies of your books, "Patent Protection" and "When and How to Sell an Invention." (Note: Same books supplied by any of branch offices listed above).

Name.....

Street and No.....

City or Town.....

PATENTS

Booklet Free Highest References
Promptness Assured Best Results

Send drawing or model.

ALL BUSINESS GIVEN PROMPT AND PROPER ATTENTION

Listed Patent Lawyer in the latest editions of the Rand-McNally Directory of Bankers and Bank-Recommended Attorneys, published by Rand-McNally & Co., Chicago, Ill.; The Baggott & Ryall Directory of Guaranteed Attorneys, published by Legal Directory Corporation, Boston, Mass.; American Lawyers Annual, Cleveland, Ohio; Bankers Service Legal Directory, published by Bankers Service Co., Boston, Mass.; Eyre's Law List, 9 Park Place, New York City; Snow-Church Directory Co. Lawyers List, published in New York City, and the Central Guarantee Co., Bankers and Lawyers Directories, 630 Fifth Avenue, New York City.

WATSON E. COLEMAN,
REGISTERED PATENT LAWYER

Victor Building, 724 Ninth Street, N. W.
WASHINGTON, D. C.

INVENTORS PATENT YOUR IDEAS SEND FOR FREE BOOK



HOW TO OBTAIN A PATENT

Written by a Former Member of the Examining Corps (1922-24) of the U. S. Patent Office. If you want to profit by your idea, you should take steps to apply for a U. S. Patent at once. Your first step is to get this Free Book. This interesting illustrated book contains valuable information you should have. It tells you fully how to obtain a patent on your idea in the quickest way. With this Free Book you will also receive a "Record of Invention" form on which you can easily record your idea. Personal and Confidential Service: Your case will be personally handled only by a Registered Patent Attorney who is also a Former Member of the Examining Corps of the U. S. Patent Office. All communications confidential.

MAIL COUPON TODAY for FREE PATENT BOOK and RECORD OF INVENTION Form.

CARL MILLER
REGISTERED PATENT ATTORNEY
FORMER MEMBER EXAMINING CORPS U. S. PATENT OFFICE

1533 Woolworth Bldg., Dept. 127A, New York City
MILLER BUILDING, Dept. 127A, WASHINGTON, D. C.

Please send me your Free Book, "How to Obtain a Patent," and your "Record of Invention" form.

NAME.....

ADDRESS.....

PATENTS—TRADE MARKS

All inventions submitted held confidential and given personal attention by members of the firm.

Form, "Evidence of Conception" and instructions, "How to Establish Your Rights"—FREE!

LANCASTER, ALLWINE & ROMMEL

Patent Law Offices

412 Bowen Bldg. Washington, D. C.

NEW BENJAMIN AIR PISTOLS

Powerful - Accurate - Economical - Practical - Adjustable Shooting Force - Amazing Maximum Velocity - only 177 or 22 and BB For Target and Small Game - the only Genuine Compressed Air Pistol for Shooting BB on the market - Single Shot with Bolt Action - Hammer Fire - High Trigger Safety. Price \$7.50. Shot BB Air Rifle \$6.95 - 25 Shot BB Repeater Air Rifle \$7.50 - at Dealer or Direct - No License Required - Cash for balance due. FULL DETAILS—TARGETS—FREE—WRITE TODAY Benjamin Air Rifle Co., 345 Marion St., St. Louis, Mo.



\$7.50

Inventions Wanted Patented or Unpatented

We have been successfully selling inventions, patented and unpatented, since 1924. Write for proof, and tell us what you have for sale.

Chartered Institute of American Inventors
Dept. 4, Barrister Building, Washington, D. C.



G E A R S

In Stock—Immediate Delivery

Gears, speed reducers, sprockets, thrust bearings, flexible couplings, pulleys, etc. A complete line is carried in our Chicago stock. Can also quote on special gears of any kind. Send us your blueprints and inquiries.

Write for Catalog No. 10

CHICAGO GEAR WORKS
769-773 W. Jackson Blvd. CHICAGO, ILL.

FLASH! FLASH! FLASH!

READ INVENTION FINANCE MAGAZINE. Your subscription 50c, entered on promise to pay on receipt of first copy. Place your order by cutting out and mailing this advertisement.

INVENTION & FINANCE MAGAZINE
80-G Wall Street New York, N. Y.

INVENTORS

who derive largest profits know and heed certain simple but vital

facts before applying for patents. Our book, Patent-Sense, gives those facts; sent free. Trade Marks—Copyrights.

LACEY & LACEY, Est. 1869, 635 F St., N. W., Dept. 5, WASHINGTON, D. C.

ALBERT E. DIETERICH

THEODORE H. RUTLEY

REGISTERED PATENT LAWYERS

512 B Colorado Bldg. WASHINGTON, D. C.

Booklet on Patents sent free

STOP Scratching

RELIEVE ITCHING SKIN Quickly

Even the most stubborn itching of eczema, blotches, pimples, athlete's foot, rashes and other externally caused skin eruptions, quickly yields to cooling, anti-septic, liquid **D. D. D. PRESCRIPTION**, Dr. Dennis' original formula. Greaseless and stainless. Soothes the irritation and quickly stops the most intense itching. A 35c trial bottle, at drug stores, proves it—or money back. Ask for **D. D. D. PRESCRIPTION**.

To PROTECT YOUR INVENTION - Use this coupon, NOW

Delays are dangerous and may be very costly. My personal service assures prompt action, strict confidence, and a minimum of expense. I suggest that you send me a model or drawing, or sketch and description of your invention, and \$5.00. I will make a search and report

promptly as to its patentability and send you a copy of my 72-page booklet. Or, if you prefer to read my booklet first, mail the attached coupon at once. I will also send my "Record of Invention" form. (Over 38 years experience as a Registered Patent Attorney.)

L. F. Randolph, 302-D Victor Bldg., Washington, D. C.

Please send me at once, free of charge, your 72-page booklet and "Record of Invention" form.

Name.....

Address.....

A PERSONAL CONFIDENTIAL PATENT SERVICE—

Air Become An Conditioning Engineer

Rich, fast-growing field for men thoroughly trained in design, manufacture, estimating and installing. In 1936, Air Conditioning did a 49 million dollar business—while in the first 5 months of '37 it skyrocketed to 50 million—14 TIMES as many installations as in 1933. FREE booklet on home study points out YOUR opportunities in Air Conditioning. Tells WHY this new industry promises steady work, good pay, promotion, and jobs where you are still young at 40. No obligation. Write TODAY.

American School, Dept. AC-945, Drexel at 58th, Chicago

A billion dollar industry in the making!

RUPTURED?

Get Up-To-Date Relief

Why try to worry along with old-fashioned trusses that gouge your flesh—press heavily on hips and spine—enlarge opening—fail to hold rupture up and in? You need the Cluthe. No harness. Automatic adjustable pad seals opening—follows every body movement with instant increased support in case of strain. Cannot slip. Holds rupture whether at work or play. Light, easy to wear. Waterproof. Can be worn in bath. Send for amazing **FREE** 100 page, cloth-bound book "Advice To Ruptured" and details of liberal truthful 60-day trial offer. Also names of grateful Cluthe users (publication permitted) in your neighborhood. Write today. Cluthe Sons, Dept. 312, Bloomfield, New Jersey.



**CRIME DETECTION
SECRET SERVICE
AND
FINGER PRINTS**

**SECRET SERVICE BOOK
FREE**

For 30 Days' Reading
No Money Down—Actual Crime Cases—
If You Are Queer! We will send you this exciting book on Crime Detection, Secret Service and Identification. Work for 30 days free reading. Send no money. If you decide to keep it, then send me only \$1. If not, return it. **WRITE TODAY.** Literature will be sent only to persons stating their age.

T. G. COOKE, Dept. 1359, 1920 Sunnyside Ave., Chicago, Ill.

No JOKE TO BE DEAF

—Every deaf person knows that—
Mr. Way made himself hear his watch tick after being deaf for twenty-five years, with his Artificial Ear Drums. He wore them day and night. They stopped his head noises. They are invisible and comfortable, no wires or batteries. Write for **TRUE STORY.** Also booklet on Deafness.



Artificial Ear Drum

THE WAY COMPANY

720 McKensley Bldg.

Detroit, Michigan



TOMBSTONES

\$11⁰⁰ UP

**FREIGHT PAID or
ERECTED**

Marble or Granite of Best Quality. Lettered. Guaranteed. Thousands sold. Write for Free Catalog and samples.
U. S. MARBLE & GRANITE CO., Dept. A-15, Orono, Florida



BUCHSTEIN'S FIBRE LIMB

is soothing to your stump—strong, cool, neat, light. Easy payments. Braces for all deformities. Agents wanted.
D. BUCHSTEIN CO.
610 3rd Ave., So., MINNEAPOLIS, MINN.

Send for Catalog Today

NEW SCIENTIFIC WONDER

"X-RAY" CURIO

10c
3 for 25c



X-RAY CURIO

Reg. U.S. Pat. Off.

"Silver Only"

BOYS BIG FUN. You apparently see thru cloth, Wood, Stone, any object. See Bones in Flesh. **FREE PACKAGE** radio picture films, take pictures without camera. "You'll like 'em." 1 package with each 25c order.
MARVEL MFG. CO., Dept. 20 — **NEW HAVEN, CONN.**

USEFUL INVENTIONS

DESERVE strong PATENTS

Many inventors have not reaped the benefits of their inventions . . . because they did not obtain strong patents. Are you adding your name to this pathetic list, or do you realize the value of good patent protection?

As Registered Patent Attorneys before the United States Patent Office, our practice is confined exclusively to patents, trade marks, copyrights, and includes every branch of the business. We prepare licenses, contracts and agreements, and give legal advice to our clients. Every case is treated with the *strictest confidence.*

PROTECTING YOUR INVENTION

Do you know how to obtain a patent? How to go about selling it? What makes a patent valuable? Do you know the importance of *absolute secrecy* in patent matters? Do you know what can be patented? Do you know the cost of a patent and how you may pay for it on *convenient terms*? We will answer these and many other questions for you absolutely free.

C. A. SNOW & CO. have had over 62 years' experience in patent matters. We have secured thousands of patents for our clients, in every field of invention. Our free booklets on patent matters answer questions every inventor wants to know. They are free. **MAIL THE COUPON NOW.**

C. A. SNOW & CO.

Registered Patent Attorneys Since 1875

Dept. A-23 Snow Building, Washington, D. C.

Gentlemen: Send me your free handbooks for inventors by return mail. No obligation on my part.

NAME.....

ADDRESS.....

CITY..... STATE.....

When writing please mention Popular Mechanics



There's Quicker, Bigger MONEY for YOU-in POULTRY

Earn \$1,000 to \$2,500 a Year or Have a Business of Your Own!

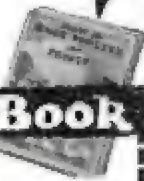
Whether you want a job at good pay or a highly profitable business of your own—Poultry Raising offers you more than any other easily-learned trade or profession. Poultry meat and eggs are always in demand—and there is a shortage of trained poultrymen. My Home Study Course trains you quickly to fill a good job in poultry—and my Personal Employment Assistance will help you get one!

Spare Time or Full Time YOU CAN Cash-in BIG

No matter where you live—city, town or country—or what you do now, my proved methods will assure your success right from the start. I'll help you make from \$1,000 to \$2,000 a year and UP! And, if you choose to start your own business, I'll show you how to make your tiny investment multiply itself automatically. What I've done for thousands of others—I can do for you.

FREE Book Shows the Way to Big Pay and BIG Profits

Mail coupon below TODAY—for my Big NEW FREE Book, "How to Raise Poultry for Profit." My forty years of experience are yours. The Poultry Industry needs YOU. You need my book. Get it—and get in line for the BIG Money that's waiting for you in POULTRY.



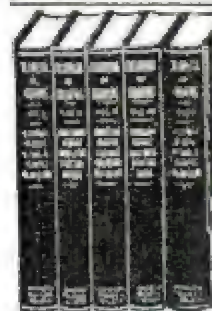
Mail NOW for FREE Book

NATIONAL POULTRY INSTITUTE, Dept. 36-C, Adams Center, N. Y., Att'n: Harry M. Lamon, Pres.

Dear Mr. Lamon: Send me your FREE Book, "How to Raise Poultry for Profit." I want to know more about my opportunity to make \$1,000 to \$2,500 a year, spare or full time.

Name.....

Address.....



DRAFTING

BOOKS SENT FREE!

ON APPROVAL
5 VOLUMES BRAND NEW EDITION
Only 15 minutes a day with these WONDER BOOKS can prepare you for a good drafting job in less than a year. Mechanical and architectural drafting from simple straight lines to important complex plans. A step at a time! Built especially for beginners, for men with only grammar schooling. Drafting room practice. PLUS ENGINEERING, made easy and clear. Includes complete course in blueprint reading.

Big Field Big Demand Big Pay
Competent draftsmen are urgently needed right now in all building and manufacturing lines at \$40.00 to \$75.00 a week. That's just the beginning—FOR DRAFTSMEN HAVE THE BEST CHANCES FOR ADVANCEMENT. Pleasant, fascinating work, easy to learn and do. Learn quickly with these books—send coupon for a set and see for yourself.

A year's consulting membership in the American Technical Society now given to all readers of this famous encyclopedia of drafting. Many say that it is worth more than the cost of the books. Complete set of drawing instruments if you send for these drafting books NOW. These instruments are made of the finest of German silver, are absolutely accurate and are packed in velvet lined leatherette pocket case. Real \$10 value, but included with these books.

AMERICAN TECHNICAL SOCIETY
Dept. D915, Drexel at 58th St., Chicago, Ill.

American Technical Society, Dept. D915, Drexel at 58th St., Chicago, Ill.
Send for 10 days' trial New 5 volume set of drafting. I will pay the few cents delivery charges. If I wish, I may return books in 10 days and owe you nothing but if I decide to keep them, I will send \$2.00 after 10 days, then only \$4.00 a month until \$24.00, the advertising price, is paid. Send latest edition and include drawing instruments and Membership Certificate.

Name.....
Address.....
Attach letter stating age, occupation, employer's name and address and that of at least one business man as a reference.

Gov't JOBS

Men, Women, Age 18 to 50

START AT \$1260 TO \$2100 A YEAR

Steady work, short hours! Pensions, Vacations with pay! AUTOMATIC raises. No strikes, no layoffs. Select job you want. Tested method will help you pass Civil Service Examination for earliest possible appointment. Write TODAY for FREE LIST of jobs. (If UNDER 18, ask for Special Booklet "A".) Arthur R. Patterson (Former Gov't Examiner), Principal, PATTERSON SCHOOL, 812 Mercantile Bldg., Rochester, N. Y.

Social Security Employees to Be Hired Through Examination

Send for FREE LIST

CARTOON YOUR WAY TO SUCCESS!



DON'T COPY—LEARN TO ORIGINATE!

RAYE BURNS will teach you HOW to CREATE ORIGINAL CARTOONS at home that you can SELL! Course contains 26 lessons and over 600 illustrations. All for Only...

\$3.85

Send name and address for free details.

RAYE BURNS SCHOOL, Dept. 10, BOX 2194, Cleveland, Ohio

AVIATION CAREER OFFERS YOU GREAT FUTURE!



Demand for trained aircraftmen in Southern California is increasing and already exceeds supply. Curtiss-Wright Technical Institute, Aviation's foremost and oldest school, is located in heart of this activity and specializes in Sheet Metal, Master Mechanics and Aero Engineering. (No flying involved.) Graduates are obtaining immediate employment. Write for details NOW! Curtiss-Wright Technical Institute, Glendale, (Los Angeles) Cal., Dept. PM-12



TRI-STATE COLLEGE

B. S. Degree in 2 years. World famous for technical 2-year courses in Civil, Electrical, Mechanical, Chemical, Radio, Aeronautical Engineering; Business Administration and Accounting.

Those who lack high school may make up work. Low tuition. Low living costs. Located in picturesque hill and lake region. Students from every state and many foreign countries. 54th year. Enter September, January, March, June.

Write for catalog.

4127 College Ave. ANGOLA, IND.

You Can Regain Perfect Speech, if you

STAMMER

Send today for beautifully illustrated book entitled "DON'T STAMMER," which describes the Bogue Unit Method for the scientific correction of stammering and stuttering. Method successfully used at Bogue Institute for 36 years—since 1901. Endorsed by physicians. Full information concerning correction of stammering sent free. No obligation. Benjamin N. Bogue, Dept. 185 Circle Tower, Indianapolis, Indiana.

GUITAR

You'll enjoy learning for less than 2c a day. Full particulars Free. Write today.

Hamann Institute of Music, 3016 N. 24th Pl., P-12, Milwaukee, Wis.



WILL YOU WEAR THIS SUIT and Make up to \$12 in a Day!

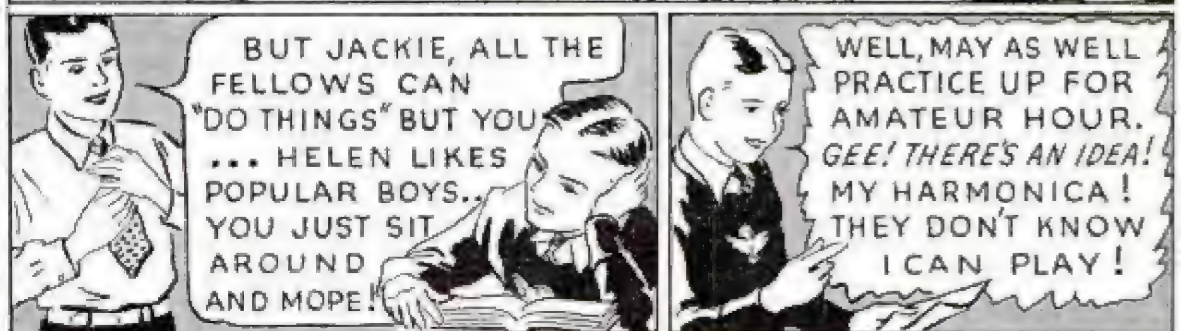
Let me send you this fine all-wool Union tailored suit FREE OF COST. Just follow my easy plan and show the suit to your friends. Make up to \$12 in a day easily. No experience—no canvassing necessary.

Send for Samples—FREE OF COST
Write today for FREE details. ACTUAL SAMPLES and "sure-fire" money getting plans. Send no money.

H. J. Collin, Progress Tailoring Co., Dept. Y-216
500 S. Throop St. Chicago, Ill.

THE HERO OF AMATEUR HOUR

Jack was the "HIT" of Helen's Party ... and he wasn't even there!



Boys and Girls who are good Harmonica players are always popular—always in demand at parties and "get-togethers." Don't miss good times. Learn to play the Harmonica. It's so easy with the new Hohner Instruction Book. Just mail the coupon for your Free copy.

M. HOHNER, Inc. 351 Fourth Ave. New York



MAIL COUPON FOR **FREE** INSTRUCTION BOOK

M. HOHNER, Inc. Dept. 20M
351 Fourth Ave., New York City

Please send me your new Instruction Book FREE.

Name _____

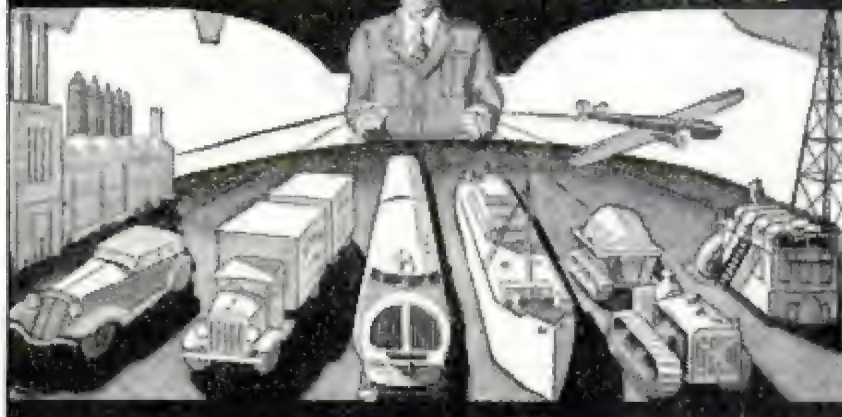
Address _____

City _____ State _____

Address Canadian inquirers to Hough & Kohler, Ltd., Toronto

When writing to advertisers please mention Popular Mechanics

The Diesel Engineer



Is Your Job Safe?

Just as the gasoline engine changed the jobs of thousands who depended on horse-drawn vehicles for their living—so now the Diesel engine is fast invading both the power and transportation fields, and threatening the present jobs of thousands.

What This Field Offers You

Diesel engines are replacing steam and gasoline engines in power plants, motor trucks and busses, locomotives and ships, aircraft, tractors, dredges, pumps, etc.—opening up well-paid jobs for Diesel-trained men. You get all the latest Diesel developments in our course. Special diagrams for quick understanding of this new power.

2 Diesel Lessons Free

Men Over 18—Under 40

This opportunity is NOT open to boys under 18 or men over 40. But if you are WITHIN these ages, you owe it to yourself to investigate this opportunity of acquainting yourself with Diesel—the new, fast-growing field.

No experience necessary. At our expense, see how plain every point is made—how thoroughly you grasp it—how greatly you will enjoy the work. If you are over 18 and under 40, send postcard, state age, and get 2 beginning lessons FREE. No obligation. This may be the turning point in your life, so write TODAY!

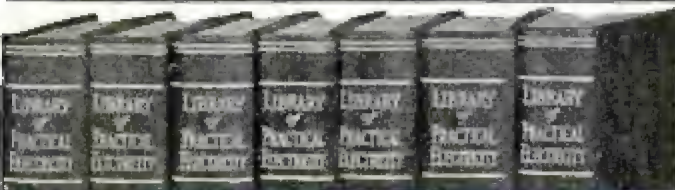
AMERICAN SCHOOL, Dept. D 945, Drexel Avenue at 58th Street, Chicago, Illinois

Test Yourself for a Good Pay Job—Steady Work

Be a GUNSMITH — Make Big Money!

Big-money opportunity in this uncrowded field. Easy, practical course. Learn at home—gun mechanics, how to repair, restock, blue, check, refinish, make new parts, etc. Earn while you learn. Write today for prospectus.

GUILD SCHOOL of GUNSMITHING, Dept. A-12, Newark, Ohio



Know Electricity as Experts Know It—and Get an Expert's Pay!

Recovery has begun! The months ahead are charged with significance and expectation. What will you do to get the jump on the other fellow? Thousands of men have used

The Croft Library of Practical Electricity

The Croft Library is a complete electrical educator. It is founded on practice—on 20 years of shirt-sleeve experience—on work as it is actually done. It is jammed from cover to cover with the kind of hard-headed facts you want. Written so that the beginner can easily understand it, yet so sound, so thorough, that it is the daily guide of 50,000 highly paid electrical workers and engineers. Croft tells you the things you need to know about motors, generators, armatures, commutators, transformers, circuits, switchboards, distribution systems—electrical machinery of every type—wiring for light and power—wiring of finished buildings—underwriters' and municipal requirements—illumination in its every phase—the most improved methods of lighting—lamps and lamp effects, etc.—how to do a complete job, from estimating it, to completion.

No money down—easy payments

Fill in and mail the coupon attached and we will send you the entire set of seven volumes for ten days' free examination. We take all the risk—you assume no obligation. If you decide to keep the books, send \$1.50 in ten days and the balance at the rate of \$2.00 a month. Send the coupon NOW and see the books for yourself.

FREE EXAMINATION COUPON

McGRAW-HILL BOOK CO., 330 W. 42nd St., New York

Send me for ten days' free examination the Croft Library of Practical Electricity. If satisfactory I will send you \$1.50 in 10 days and \$2.00 monthly until the price of \$19.50 is paid. If not wanted, I will return the books postpaid. (To insure prompt shipment write plainly and fill in all lines.)

Name.....

Home Address.....

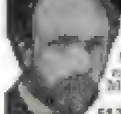
City and State.....

Position.....

Name of Company..... PM-12-37

Write and Speak

MASTERLY ENGLISH



Learn correct English with Sherwin Cody's new invention. No rules to memorize. Like a fascinating game, hour-time study, 15 minutes each day quickly gives you command of English. Send for free book, "How You Can Master Good English in 15 Minutes a Day." Write today. **SHERWIN CODY SCHOOL of ENGLISH** 512 Seaside Bldg., Rochester, N. Y.



BE A CARTOONIST

AT HOME IN YOUR SPARE TIME under personal supervision of the famous cartoonist NORMAN MARSH creator of "DAN DUNN" appearing every day in his papers. Success—Fame—Real Money may be yours when you learn Marsh's easy simple methods and secrets. Send name and address for free details of MARSH'S Personal course. ACT TODAY! **MARSH CARTOON SCHOOL**

Chicago Daily News Bldg., Dept. L-1, Chicago, Ill.



Your VOICE!

100% Improvement Guaranteed or Tuition Refunded!

You to be sole judge! Strengthen and master your voice—not with singing lessons—but by scientific vocal exercises, successfully taught for over a century. Mysterious exercises DISCREETLY Kept. Write for Free Voice Book, Learn WHY and HOW you can now have the voice you want. If under 10, we require parent's signature. With 100% improvement guaranteed—will you faithfully follow instructions? If so, WRITE: **Perfect Voice Institute, Studio 1359, 64 E. Lake St., Chicago**

Learn **ADVERTISING** at Home

Greater opportunities now in advertising. Learn easily and quickly in spare time. Practical work. No text books. Old established school. Low tuition—Easy terms. Send for free booklet and requirements.

Page-Davis School of Advertising Dept. 1359, 3601 Mich. Av., Chicago

RAISE GIANT FROGS

FREE BOOK



BIG DEMAND! Markets waiting for all you can ship. Good prices the year round.

WE BUY! Breeder lays 30,000 eggs yearly. Get ready now for spring spawn. Start with small pond, creek, brook. Free book shows sketch. **MEN & WOMEN** see what others are doing.

SEND NO MONEY Just your name-address on postcard brings special offer to beginners. Write **American Frog Canning Co. (Dept. 133-X), New Orleans, La.**

THEY ALL

SAY:

WE GOT OUR JOBS ...AND ARE IN THE MONEY BECAUSE WE HAD FNT TRAINING



First National Television is recognized throughout the technical world as probably the best institution for radio and television. It bridges school and actual on-the-job work. It put something into my future I could not have obtained elsewhere.

Ralph William Rea
Chief Engineer, KORD
La Junta, Colorado

My FNT training and actual experience on your stations KXBY and W9XAL made me the first man selected when W9XAL went on the air. We just employed another First National graduate.

Thurston A. Greene,
Engineer, W9XAL,
Rochester, N.Y.



Graduating from FNT I obtained a service shop position without losing a single day. Experience at your station, KXBY, while training, and my license enabled me to obtain my present position on the WJHF engineering staff.

Nathan W. Aram,
Operator, WJHF,
Rock Island, Ill.



My training at FNT gave me the education necessary to secure my first class license—and a fine position at KGFY. I am happy to know so many of my classmates are making good in a big way.

Robert H. Dye,
Chief Engineer, KGFY,
Pierre, South Dakota



Several weeks after completing First National training, I took over the duties as Chief Engineer. Thanks to the actual experience secured through FNT's radio and television stations, and the service record on my license, I was hired without question.

J. D. Miller,
Chief Engineer, KBTM,
Jonesboro, Arkansas



The complete and thorough training I received at First National enabled me to obtain my present position, and handle it most successfully. I am now planning to take advanced work at First National and enter the broadcasting end of radio.

Adrian I. White,
Guenther Electric Shop,
Beaver Dam, Wis.



I took First National Television training on recommendation of a friend, and it has been everything I expected and more. Your training won me a first class operator's license and a good job at a 3000-watt transmitter here at KPHL.

Harold Davis,
Operator KPHL,
Abilene, Kansas



Because of the thoroughly complete, high-class, modern training combined with the 100% cooperation of First National Television I have built and developed a fine business of my own, selling and servicing radios and accessories, which is having an outstandingly rapid growth.

Firdell R. Yardley,
Guenther, Okla.



I got my position at this 3000-watt station soon after finishing training. First National's reputation for turning out men who really know radio proved a big factor in my getting this job.

Alvin W. J. Wessel,
Operator WIRE,
Indianapolis, Ind.



STEP UP AND TAKE YOUR PLACE WITH THESE FELLOWS IN RADIO CAREERS



If you want more money—thrilling, enjoyable jobs—comfort and security of key positions in an uncrowded ever-expanding industry—get "VISION", a phenomenal free book telling you how!

BE A RADIO EXPERT! QUALIFY FOR A GOOD JOB! Now Easy to Train AT HOME in Spare Time!

Scores and scores of men are today successfully filling fine jobs at good salaries. FNT training gave them the practical knowledge, experience, advanced discoveries, and copyright information made possible by an organization like First National Television, large enough to operate its own Radio Station, KXBY, and Television Station W9XAL. Such big-time methods speed your training—assure you qualified experience that brings big earnings and choice jobs.

YOU GET PRACTICAL EXPERIENCE AT HOME! Complete Training Laboratory—Yours to keep!

FNT "Home Laboratory Method" of expert training makes you thoroughly familiar with the actual handling, operation and construction of Radio-Television apparatus and equipment. Although elaborate, these training methods are an economy to you, and definitely are essential to your getting the super-training that gets you the better jobs, and the better pay.

PART TIME JOBS! \$5000 JOBS! Broadcasting stations, manufacturers, retailers, aviation lines, police, and many others need countless trained Radio experts to keep pace with progress. Many lucrative jobs in radio pay up to \$5000—and more. Even spare time work pays \$15 to \$45 a week. We'll show you how to earn while learning.

QUICKLY QUALIFY FOR LICENSE—With FNT training, alert, ambitious men can qualify in just a few months for U. S. Govt. Operator's License (first class) examination—and your Operator's License is your ticket to choice jobs.

ACT NOW! GET "VISION" FREE! Discover the full facts. Learn how opportunities like Radio-Television occur only once in a life-time—and how you can now "ride to riches on a radio wave." Just mail coupon now. "Vision" tells you the things you want to know. Act!

S. G. Noel, President

FIRST NATIONAL TELEVISION, INC.

Largest and Oldest in Kansas City and the Central West. Established 1931. Own and Operate Radio Station KXBY, and Television Station W9XAL.

Dept. AA-12, Training Division, Kansas City, Mo.

THIS COUPON WORTH MONEY! USE IT TODAY!

S. G. Noel, President, **FIRST NATIONAL TELEVISION, INC.**
Dept. AA-12 Fidelity Bldg., Kansas City, Mo.

Without obligation, send me a free copy of "Vision", telling all about the opportunities in Radio-Television, and how I can easily train for them at home in my spare time.

NAME _____

STREET _____

TOWN _____ STATE _____

VISION

FIRST NATIONAL TELEVISION, INC.
Dept. AA-12 Fidelity Bldg., Kansas City, Mo.

MAIL THIS COUPON TODAY!

WORK FOR THE GOVERNMENT START \$1260 to \$2100 a Year

Railway Postal Clerks

Railway Postal Clerks get \$1,900 the first year regular, being paid on the first and fifteenth of each month. (\$79.17 each pay day.) Their pay is automatically increased yearly to \$2,450. Advance may be had to Chief Clerk at \$2,700 a year. (\$112.50 each pay day.)



Railway Postal Clerk, Minneapolis, Minn.

"I received my appointment as Railway Postal Clerk and have been working full time and some overtime. Your training taught me what to do and how to do it. To this training must go a large share of the credit."

O. K. Duscholdt,
Minneapolis, Minn.

3 Days On—3 Days Off—Full Pay

Railway Postal Clerks on long runs usually work 3 days and have 3 days off duty or in same proportion. During this off duty their pay continues just as though they were working. They travel on a pass when on business. When they grow old, they are retired with a pension.

City Mail Carriers, Post Office Clerks

Clerks and Carriers now get \$1,700 the first year on regular and automatically increase \$100 a year to \$2,100 and \$2,300.



Working Mail Carrier, Philadelphia, Pa.

"As a result of your training I stood 98.8 per cent and was appointed Mail Carrier soon after the examination and am now working. I was also offered a position as Railway Postal Clerk."

Kenneth Albert,
Philadelphia, Pa.

Customs Inspector

Salary \$2,100 to start. Men 23 to 45. Work connected with examining baggage and merchandise entering the country from foreign ports covering boats, trains, roads, automobiles, etc.

Many Other Positions

Many other positions are obtainable. Those wishing these positions should qualify at once.

Get Free List of Positions

Fill out the following coupon. Tear it off and mail it today—now, at once.

This investment may result in your getting a big-paid government job.

FRANKLIN INSTITUTE, Dept. K173, Rochester, N. Y.

Rush to me, entirely free of charge (1) a full description of U. S. Government Jobs; (2) Free copy of illustrated 32-page book, "How to Get a Government Job"; with (3) List of U. S. Government Jobs; (4) Tell me what to do to qualify for a U. S. Government Job.

Name.....

Address.....

Use This Coupon Before You Mislay It. Write or Print Plainly.

When writing please mention Popular Mechanics

"KNEE ACTION" for Your BICYCLE



ONLY \$1.00 COMPLETE

Float over cobble stones with 1936 Packard smoothness. Sail over curb stones with hardly a jar. Ride miles farther and faster without getting tired. Anybody can attach KNEE ACTION quickly to any make or size bicycle in two minutes with a wrench. Nothing to wear out or get out of order. Patents applied for. Lasts a lifetime. Be first in your town. **SEND NO MONEY!**—Rush postcard for your KNEE ACTION and instructions. Pay postman only \$1, plus few cents postage on delivery. If not delighted in 15 days, return and we'll refund your dollar. We include FREE details on how to make money selling to friends.

PACKARD KNEE ACTION CO., Dept. Z-957
4306 Marburg Ave. Cincinnati, Ohio

Cheap Heat—No Coal

Remarkable, Cheap Invention, Burns Cheap Grade Diesel Oil Once Thrown Away as Useless—Converts any Stove or Range to Fast, Clean Heat—Hotter, More Economical Than Coal or Wood—Banishes Wood Chopping and Ashes. Sent on 30 Days' Free Trial.

Over 10,000 already in use. No more Coal and Wood drudgery. No more getting up freezing winter mornings to coax stubborn fires. Safe. Temperature controlled. Many wonderful automatic features. Runs on pennies. Sent on 30 days' trial at our risk. Agents Wanted—we will select parties in each locality to receive one FREE for installing in their own homes to demonstrate. Make up to \$60 weekly and more booking orders. Selling fast. Write at once—peak of season now—no time to lose. Name and address on one cent postcard will do. Brigham Oil Burner Co., Dept. 2027-N, St. Louis, Mo. Approved by National Board Fire Underwriters.

GAG-CARTOON!



AND MAKE BIG MONEY—AT HOME—BY MAIL! Magazine pay up to \$300.00 per cartoon. Get in this NEW FIELD and beyond own head. My 50 lessons—1000 Illustration course show you how. FREE CARTOON MARKETS INCLUDED—\$280

All for..... Send for FREE details. FREE drawing set with course. MOON GAG-CARTOON SCHOOL Paramount Bldg. Dept. A-5, Fall Creek, Wis.

LEARN WATCHMAKING AND ENGRAVING

BY OUR PROFIT-SHARING PLAN
OUR GRADUATES SUCCEED

One of our Iowa students started in a very small way—now doing over \$30,000 a year. Another in Wisconsin, over \$10,000 the first year. Day or night classes. Call or write for FREE BOOK. Chicago School of Watchmaking, Dept. 5201, 155 N. Clark St., CHICAGO.



A AND N SUPPLY CO.

Bargains—Military, Sport Goods, Firearms, Clothes, Shoes, etc. Send 10¢ for new catalog, to be redeemed on first order.

EST. 1869 A & N Supply Co., 4773 Lester St., Richmond, Va.

don't WORRY

Why put up with years of needless discomfort and worry? Try a Brooks Automatic Air Cushion. This marvelous appliance permits the opening to close, yet holds reducible rupture securely, comfortably—day

and night. Thousands report amazing results. Light, neat-fitting. No hard pads or stiff springs to chafe or gouge. Made for men, women and children. Durable, cheap. Sent on trial to prove it. Never sold in stores. Beware of imitations. Write for Free Book on Rupture, no-risk trial order plan, and proof of results. All correspondence confidential. BROOKS COMPANY, 111-M State St., Marshall, Mich.



What to Eat to Get STRENGTH-BUILDING IRON IODINE AND VITAMINS into Blood & Glands

How Kelpamalt, Rich Iron, Iodine and Vitamin Concentrate From the Sea Has Built Hosts of Worn-Out, Pale, Sickly Folks into Strong, Red-Blooded Men and Women

Must Add Solid Extra Lbs., New Strength and Energy the First Week or No Cost!

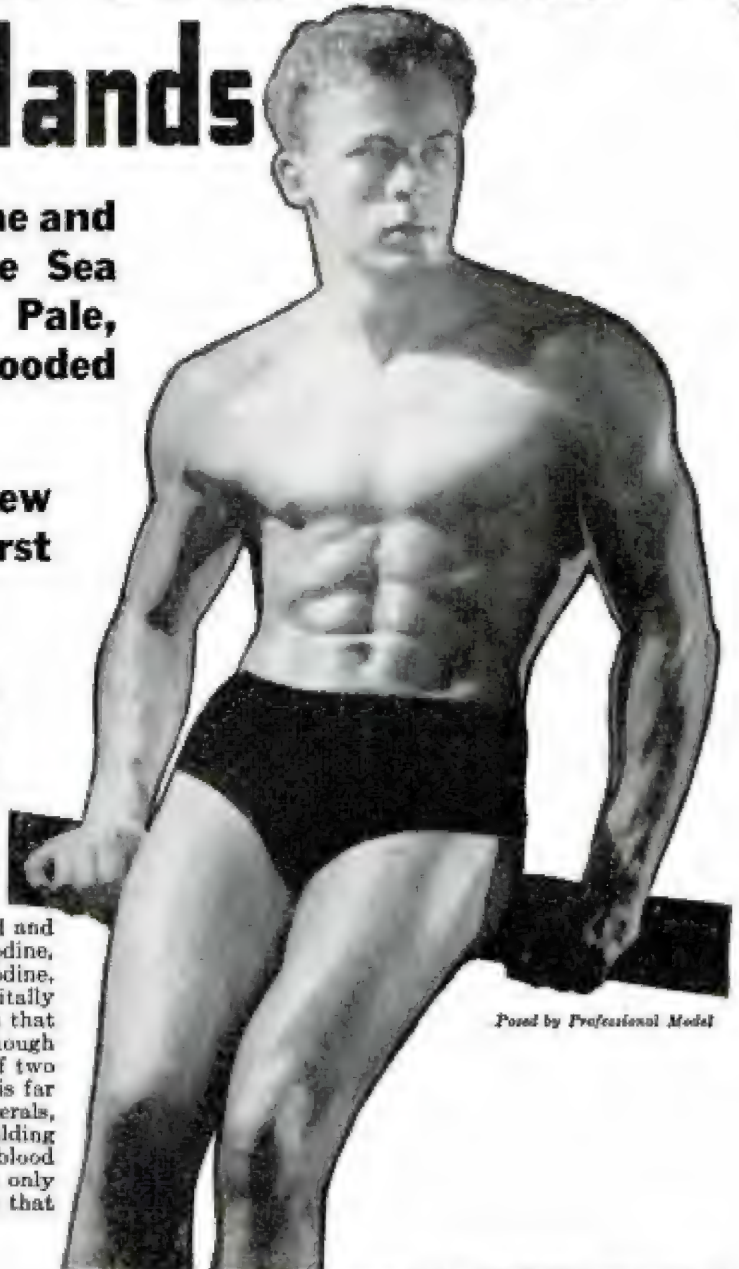
Malnourishment (an insufficient supply of minerals and vitamins) often explains why folks stay thin, ailing, worn-out with weakened resistance. Doctors know appetite satisfying foods are deceiving because frequently they lack vital minerals and essential vitamins needed for body building. As a result you do not get the good out of the food you eat and your system lacks in strength, energy and weight.

Many thousands of sickly, pale, ailing folks have found glorious relief with Kelpamalt. This amazing iron, iodine and vitamin concentrate is rich in vital elements necessary for the body's chemical processes. It contains assimilable iron, copper, phosphorus and calcium vitally needed for blood and tissue building. Most important is Kelpamalt's natural iodine, not to be confused with ordinary liquid, chemical iodine. Iodine, scientists say, is found in the blood, liver and glands. It is vitally important to their normal functioning. A recent report states that 60 million people in the United States are not getting enough iodine in their daily food. Experts recommend the addition of two plates of oysters each week for their iodine, yet Kelpamalt is far richer in iodine than oysters. In addition to these precious minerals, Kelpamalt contributes to the supply of the resistance building Vitamin A, the growth and body building Vitamin G, the blood building Vitamin C, and the bone building Vitamin D. It is only when there is an adequate supply of vitamins plus minerals that you can get the good out of your food.

Make this Simple Test!

Try Seedol Kelpamalt for 1 week. See if, like thousands of others, you don't feel better, sleep better, eat better and add at least 5 husky new lbs. the first week. If you don't the trial is free. It costs you nothing. Your own doctor will approve this way. Get Seedol Kelpamalt now. It costs but a few cents a day to use and is sold at all good drug stores. Beware of cheap, ineffective substitutes. Insist on genuine Seedol Kelpamalt Tablets.

SEEDOL
Kelpamalt Tablets



Posed by Professional Model

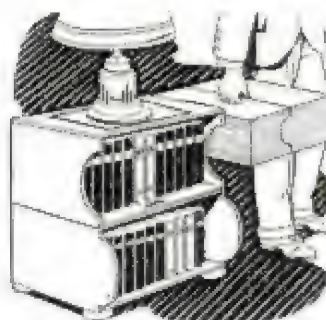
SPECIAL FREE OFFER

Write today for fascinating instructive 50-page booklet on How Thousands Have Built Strength, Energy and Added Lbs. Quickly. Mineral and Vitamin contents of food and their effects on the human body. New facts about NATURAL IODINE. Standard weight and measurement charts. Daily menus for weight building. Absolutely free. No obligation. Kelpamalt Co., Dept. 1352, 27 West 20th St., N. Y. C.

NAME.....
STREET.....
CITY.....



TRAVELERS may carry their books quite conveniently if a portable, folding bookcase is placed on the market.

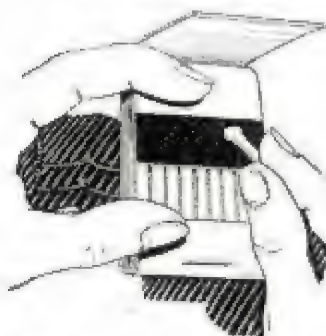


The case has two sections large enough for several volumes. In open position, one section rests on top of the other. In closed position, the sections fit together. A hand grip is provided for carrying the case.

AN ATTRACTIVE lamp stand just patented would be an addition to the home. The stand consists of several metal rods looped together at one end to form the base. At the other end the rods are bent at an angle to form a supporting column for the socket, lamp and shade. The electric cord is concealed in the supporting column.



TO HELP guard against the other matches in the book catching fire when one is struck, a newly patented match package has an inner flap which covers the heads of the matches. This flap has the abrasive strip for striking matches so placed that the heads of the other matches must be covered before one can be ignited.



NEATNESS of the necktie is the purpose of a necktie spreader on which a patent recently was issued.

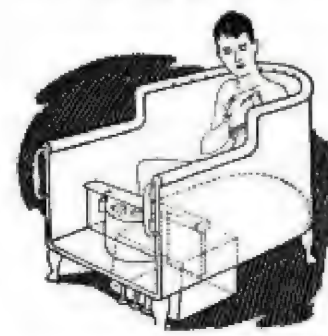


The spreader consists of a thin strip of metal which is inserted into the tie at right angles to, and just below, the knot. In that position, the device keeps the tie from twisting and results in an even flow of the fabric.

PROTECTION of the miner against dust is afforded by a hydrespirator. Designed to be worn by the workman, the equipment consists of a tank, an air tube and a mouthpiece. Air is conducted through liquid in the tank to the user's mouth, thus filtering out the dust. A strap holds the mouthpiece firmly over the mouth and nose.



HAZARDS of the bathtub are eliminated by a new tub design. Shaped like a chair and combining features of bathtub, foot bath and spray bath, the tub permits the bather to sit comfortably while a shower plays over his body. Hand rails and an entrance step are among the safety features.



(Continued to page 63A)

VACU-MATIC SCORES AGAIN!

BOB McKENZIE

TRANSCONTINENTAL AUTOMOBILE CHAMPION
COAST TO COAST

WESTERN UNION
TIMED

NEW YORK
TO
LOS ANGELES
34 hrs. 45 min.

LOS ANGELES
TO
NEW YORK
37 hrs. 38 min.

CANADA
18 000 miles
18 days

LOS ANGELES
TO
NEW YORK
AND RETURN
37 hrs. 38 min.

WASHINGTON, D.C.
TO
MEXICO CITY
32 hrs. 27 min.

LOS ANGELES
TO
PHOENIX
9 hrs. 18 min.

MURDOCKVILLE
1337 mi. in 1 day

LOS ANGELES
TO
MEXICO CITY
32 hrs. 27 min.

LOS ANGELES
TO
MEXICO CITY
32 hrs. 27 min.

Vacu-matic Carburetor Co.
7617 W. State St.
Wauwatosa, Wisconsin

Dear Sirs:

Having just completed a new speed record between Los Angeles and Chicago, driving a 1936 Chevrolet equipped with a Vacu-matic carburetor control, I thought you might be interested in knowing some of the facts and the important part Vacu-matic played in the success of the run.

The distance covered was 2322 miles in thirty nine hours and forty-two minutes, officially timed by Western Union, which gave me an average speed of 59.7 M.P.H. based on elapsed time and with the Vacu-matic averaged 18 1/2 miles per gallon on gasoline.

Before leaving Los Angeles, we made several test runs both with and without the Vacu-matic, and the tests proved that Vacu-matic increased my gas mileage 3 1/2 miles per gallon at the driving speed of 80 M.P.H. and also very noticeable increase in both acceleration and power.

After this experience with Vacu-matic, you can depend that on my future speed runs across country that I will be depending on Vacu-matic to give me the same added performance it has proven on this last record breaking drive.

Yours very truly,

Bob McKenzie



**Sets New
Coast-to-Chicago
Record**

**New Supercharge
Principle
SAVES GAS**

**MORE POWER - MORE SPEED
FASTER PICK-UP - NEW LIFE**

ESTABLISHING new mileage records on cars in all sections of the country, the Vacu-matic again scores in a new speed record established by Bob McKenzie transcontinental automobile champion. Los Angeles to Chicago—2,322 miles in 39 hours and 42 minutes—driving 75 and 80 to maintain a speed average of 59.7 miles per hour!

Here is speed—a gruelling grind—where quick acceleration, greater top speed—and less stops for gasoline mean those precious moments saved that make new speed records possible.

The same Vacu-matic that helped Bob McKenzie establish this speed record and gave him such fine gas savings is now available for all car owners. It is positively automatic—simple to install—inexpensive—and pays for itself many times over in gas savings.

***Automatic* - - Nothing Like It!**

Vacu-matic is entirely different! It operates on the supercharge principle by automatically adding a charge of extra oxygen, drawn free from the outer air, into the heart of the gas mixture. It is entirely AUTOMATIC and allows the motor to "breathe" at the correct time, opening and closing automatically as required. No idling troubles—no carburetor adjustments necessary. It is so simple it will amaze you—so practical it will save you many dollars on gas costs.

Fits All Cars

VACU-MATIC is constructed of six parts, assembled and fused into one unit, correctly adjusted and sealed at the factory. Nothing to regulate. Easily attached in ten minutes.

Agents and Salesmen

VACU-MATIC offers a splendid opportunity for unusual sales and profits. Valuable territories now being assigned. Check and mail coupon.

The VACU-MATIC Co.

Wauwatosa, Wis.

Guaranteed Gas Savings

VACU-MATIC must prove itself on every car. It is guaranteed to give worthwhile gas savings, quicker pick-up and more power, or it costs you nothing. "On my V-8 Ford it works miracles", says Ralph Fields. James Seeley—"On an International Truck on a round trip to Cleveland, 385 miles, it saved 19 gallons of gas." A. V. Grove—"On the Buick it showed 5 miles more per gallon." F. S. Peck—"I average 22 miles per gal. on my Plymouth, an increase of 7 miles, for a saving of \$15.00 a month, or \$180.00 a year." Wm. Lyons—"Averaged 25 miles on a gal. with a Model A Ford at 40 miles per hour."

Free Details

You owe it to yourself to know all about this remarkable discovery. Mail the coupon below. Start saving gas with VACU-MATIC and enjoy a new driving thrill! There's no obligation—so get the facts now! Write today!

— - - FREE OFFER COUPON — - -

THE VACU-MATIC COMPANY

7617-336 W. State St., Wauwatosa, Wis.

Gentlemen: Please send me full particulars concerning the Vacu-matic and details of your Free Offer. This of course does not obligate me in any way.

Name

Address

City State

☐ Check here if interested in selling proposition.

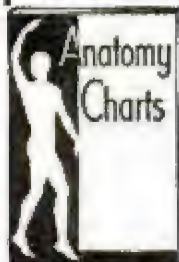
When writing to advertisers please mention Popular Mechanics

Learn this Profitable Profession



in 90 Days at Home

Hundreds of men and women of all ages 18-50 make \$10.00 to \$20.00 in a single day giving scientific Swedish Massage and Hydro-Therapy treatments. There is a big demand from Hospitals, Sanitariums, Clubs, Doctors and private patients as well as opportunities for establishing your own office. Learn this interesting money-making profession in your own home by mail, through our home study course. Same instructors as in our **NATIONALLY KNOWN** resident school. A diploma is awarded upon completion of the course. Course can be completed in 3 to 4 months. High School training is not necessary. Many earn big money while learning.



Anatomy Charts & Sample Lessons FREE

Enroll now and we will include uniform coat, medical dictionary, patented reducing roller and Hydro-Therapy supplies without extra cost. The reducing course alone may be worth many times the modest tuition fee.

Send coupon now for booklet containing photographs and letters from successful graduates, illustrated sample lesson sheets and Anatomy Charts. These will all be sent postpaid—FREE.

THE College of Swedish Massage (Successor to National College of Massage)
Dept. 984—1601 Warren Boulevard, Chicago
You may send me FREE and postpaid, Anatomy Charts, illustrated sample lesson sheets and booklet containing photographs and letters from graduates.

Name

Address

City

State

AUTO-MECHANICS & WELDERS

GOOD JOBS and Mighty GOOD PAY

Do you want to earn big money? If so let us know which of the following trades you prefer. You learn by doing. Practical work. Expert teachers. Low tuition. Personal attention. It will pay you to investigate AT ONCE. Just check the courses you'd like to take and mail today. You will receive full information, absolutely without cost or obligation. But don't delay.

Check the Trade You'd Like to Learn

- | | |
|--|--|
| <input type="checkbox"/> Auto Mechanics | <input type="checkbox"/> Welding |
| <input type="checkbox"/> Auto Collision | <input type="checkbox"/> Spray Painting |
| <input type="checkbox"/> Metal Finishing | <input type="checkbox"/> Torch Soldering |

Ask about our "Pay After Graduation Plan"

Name

Address

Mail the above to

MICHIGAN TRADE SCHOOL

Write for FREE CIRCULAR

3758 Woodward Avenue

DETROIT, MICH.

FOR Real FUN Play. A Soprani



AMPLIPHONIC ACCORDION

● Music, popularity, and romance surround you when you play your Soprani Ampliphonic accordion, a complete band in itself. Easier playing, reduced size and weight, more beautiful tone, greater volume with a third less bellowsing. Exclusive ampliphonic feature assures rapid progress. Home trial. Easy terms. See your music dealer or send postal for beautiful free book. No obligation. Act now. Write today. 158



SOPRANI, INC. DEPT. 1229
630 South Wabash Avenue, Chicago, Illinois



Correspondence Courses in RADIO and ELECTRICAL ENGINEERING

ELECTRICAL ENGINEERING Get good grasp of wide electrical field. Prepare yourself, at Low Cost, for secure future. Modern course. So simplified anyone can understand quickly.
RADIO ENGINEERING Extra fine course in radio, public address, photo-electric work. Trains you to be super-service man, real vacuum tube technician. Experimental kits furnished. Diploma given on completion. Tuition, ONLY \$25, either course. Deferred payment plan available.
FREE! Send name quick for free copies of school catalogs, student magazines, complete details. SEND NOW.
LINCOLN ENGINEERING SCHOOL, Box 931-50, Lincoln, Nebr.

SPECIAL Only \$25

AUTOMOBILE RACING BOOK

(Fourth Edition)

Nine chapters, 86 illustrations of dirt, midget, and championship cars and drivers. How to build cars and bodies; 14 plates working drawings. Ford V-8 front drive racer illustrated and described. Book answers questions on speeding up cars, balance, speed revs., rules, specifications, track records, etc. Postpaid \$1.00; C. O. D. \$1.15. Order NOW!



RAY F. KUNS, Dept. B-12
Madisonville, Cincinnati, Ohio

BE AN ARTIST

WE CAN TEACH YOU DRAWING in your own home during your spare time. Thirty-five years of successful teaching proves our ability. Artists receive large salaries.

Write today for Art Year Book
SCHOOL OF APPLIED ART

Dept. 197 10 E. Huron St., Chicago, Ill.



BUSINESS PROPOSITION RESILVERING MIRRORS, REFINISHING

Plated Articles, Autoparts, Reflectors, Tableware. Making Chipped Glass Name Plates, Signs. Experience Unnecessary. Write, **SPRINKLE, Plater, 129, Marion, Indiana**

MAIL FOR FREE INFORMATION

BEDFORD YMCA TRADE SCHOOL

1117 Bedford Ave., Dept. PM-55
Brooklyn, New York City, N. Y.

- | | |
|--|--|
| <input type="checkbox"/> Diesel Engines | <input type="checkbox"/> Oil Burner |
| <input type="checkbox"/> Diesel Engineering | <input type="checkbox"/> Welding |
| <input type="checkbox"/> Aviation Mechanic | <input type="checkbox"/> Talking Pictures |
| <input type="checkbox"/> Aeronautical Engineering | <input type="checkbox"/> Machine Shop |
| <input type="checkbox"/> Auto Mechanic | <input type="checkbox"/> Sign Painting |
| <input type="checkbox"/> Refrigeration | <input type="checkbox"/> Architectural-Mechanical Drafting |
| <input type="checkbox"/> Radio and Television Mechanic | <input type="checkbox"/> Electrical |
| <input type="checkbox"/> Air Conditioning | <input type="checkbox"/> Window Display |
| <input type="checkbox"/> Armature Winding | |

Name

Address

PARKS AIR COLLEGE

PARKS AIRPORT EAST ST. LOUIS, ILL.

Offers COLLEGE and PROFESSIONAL TRAINING Majoring in AVIATION

FOUR courses lead to B.S. degrees in Professional Piloting, Aviation Operations, Aviation Mechanics, Aeronautical Engineering.

TWELVE TRAINING PLANES are used in professional flight training which prepares graduates for airline flight operations. 74% of graduates enter air transportation in North and South America. 64,000 hours flight training given, 650 hours being flown monthly.

FACULTY of 33 specialists in various fields of aviation.

1477 graduates. Capacity enrollment of 302 for Fall term.

100-acre airport, 14 buildings devoted to school purposes exclusively. Dormitories and dining hall on the field.

Accredited by the Illinois Superintendent of Public Instruction. Government approved as a Transport Ground and Flying School and Mechanics' School. Open to high school graduates.

Winter term January 4. Send postcard for new 60-page catalog.

Registrar, Dept. PM-12
11th YEAR PARKS AIR COLLEGE, East St. Louis, Ill.

ENGINEERING DEGREE IN TWO YEARS

B.S. DEGREE courses in engineering: Electrical, Civil, Chem., Mechanical, Mech. Drafting, Radio and Television or Aeronautical. Intense, practical, thorough program. No extras for prep. or review. Earn while you learn in this industrial center. Low tuition. Enter March, June, Sept., Dec. Write for catalog. 229 E. Washington Blvd., Fort Wayne, Ind.

INDIANA TECHNICAL COLLEGE

FREE 25,000 BARGAINS in BOOKS CATALOG

Our 43rd Annual 320-Page Bargain Catalog of new Books of all Publishers lists 25,000 titles—Fiction, Juvenile, History, Scientific, etc. Illustrated, Indexed. Used by schools, colleges, libraries, and thousands of individuals. Write today for this new 1938 catalog. "Bargains in Books."

THE BOOK SUPPLY COMPANY, Dept. 136
564-566 West Monroe Street - Chicago, Illinois



Learn CHALK TALKING

Entertain for all occasions. Send \$1.00 for Laugh-Producing Program of 23 Trick Drawings with Instructions. Catalog of Chalk Talk Supplies 10c.

BALDA ART SERVICE, Dept. K, Oshkosh, Wis.

REAL JOBS OPEN

Auto, Diesel, Aviation mechanics, Body, Fender repair, Painting, Welding. Learn with few weeks practical training. Write for FREE BOOK, low tuition rate, and course interested in. **McSWEENEY SCHOOLS, Dept. 10-48, Detroit, Mich., or Kansas City, Mo.**



Print Your Own

Cards, stationery, circulars, tags, labels, advertising, etc. Save money. Print for Others; Big Profits; easy rules sent. Will do popular Raised Printing like Engraving. Junior outfit \$8.85. Senior outfit \$12 and up. Send for free catalog and all details.

THE KELSEY COMPANY, F-37, MERIDEN, CONN.

Photography for



PLEASURE or PROFIT

Prepare for profitable business or fascinating hobby, at home under guidance of qualified instructors. No previous experience necessary, common school education sufficient. Many earn while learning. Our practical studio methods also qualify for well-paying positions upon graduation. Send coupon below at once for free booklet "Opportunities in Modern Photography", particulars and requirements.

AMERICAN SCHOOL OF PHOTOGRAPHY
3601 Michigan Avenue Dept. 1353 Chicago, Illinois

Send booklet, "Opportunities in Modern Photography", full particulars and requirements.

Name _____ Age _____

Address _____

City _____ State _____

Now I'm Making REAL MONEY

Thanks to C.T.C.

FREE trial LESSON IN



AIR CONDITIONING and REFRIGERATION

Millions of dollars are being poured into AIR CONDITIONING. Thousands and thousands of jobs are opening. For the trained man this spells opportunity . . . more jobs, better jobs, more money, a business of your own. Let us show you how you can prepare AT HOME for this fast-stepping industry . . . how you can tap this rich source of income by easy, inexpensive C.T.C. spare time training. FREE TRIAL LESSON proves it. Mail post card or coupon.

Wanted . . . trained men

The cry goes out "Where can we get trained men to design, to build, to sell, to install, to repair and to service AIR CONDITIONING equipment". Get in on the ground floor now. C. T. C. has made it easy for you.

Learn at HOME

IN YOUR SPARE TIME LEARN AT HOME

(or at the College in Chicago) by the new, easy, inexpensive plan of Chicago Technical College, the well known 34 year old School of Engineering. Thousands of men have achieved success by our fascinating plan that anybody can master. We help you to a good job when ready. Send today for

FREE TRIAL LESSON

Prove to yourself that what we say is true . . . YOU can learn Air Conditioning AT HOME in your spare time . . . YOU can be a success in this field of opportunity. Fill in and mail coupon today. No charge or obligation now or later.

CHICAGO TECHNICAL COLLEGE

R301 Tech Bldg., 118 E. 26th Street, Chicago, Illinois

Please send me FREE Trial Lesson in AIR CONDITIONING and Refrigeration, and show me how I can prepare for good positions in spare time AT HOME.

Name _____ Age _____

Address _____

P. O. _____ State _____

Don't Buy

Mandolin
Guitar or
Drums

Don't buy Guitar, Mandolin, Banjo, Electric Guitars, Ukuleles, or Drums, until you have seen and tried the Slingerland May-Bells. Guaranteed More for your Money. Wonderful, snappy, powerful, pleasing tone. No equal in price. Sold on easy payments and 5 days free trial by all leading music dealers.

Cut this Adv. Out—Good for \$1.00 Credit. Send for free catalog. Mention instrument wanted.

Write today:

Slingerland Musical Instrument Mfg. Co.
1325 Belden Ave., Chicago, Illinois



Gene Krupa World's Greatest Swing Drummer Uses Slingerland Drums with Benny Goodman's orchestra.



AUDELS Carpenters and Builders Guides 4 vols. \$6



Inside Trade Information for Carpenters, Builders, Joiners, Building Mechanics and all Wood workers. These Guides give you the short-cut instructions that you want—including new methods, ideas, solutions, plans, systems and money saving suggestions. An easy progressive course for the apprentice and student. A practical daily helper and Quick Reference for the master worker. Carpenters everywhere are using these Guides as a Helping Hand to Easier Work, Better Work and Better Pay. To get this assistance for yourself, simply fill in and mail the FREE COUPON below.

Inside Trade Information On:

How to use the steel square—How to file and set saws—How to build furniture—How to use a mitre box—How to use the chalk line—How to use rules and scales—How to make joints—Carpenters arithmetic—Solving mensuration problems—Estimating strength of timbers—How to set girders and sills—How to frame houses and roofs—How to estimate costs—How to build houses, barns, garages, bungalows, etc.—How to read and draw plans—Drawing up specifications—How to excavate—How to use settings 12, 13 and 17 on the steel square—How to build hoists and scaffolds—skylights—How to build stairs—How to put on interior trim—How to hang doors—How to lath—lay floors—How to paint.



THEO. AUDEL & CO., 49 W. 23rd St., New York City

Mail Audel's Carpenters and Builders Guides, 4 vols., on 7 days' free trial. If O.K. I will remit \$1 in 7 days, and \$1 monthly until \$6 is paid. Otherwise I will return them. No obligation unless I am satisfied.

Name.....

Address.....

Occupation.....

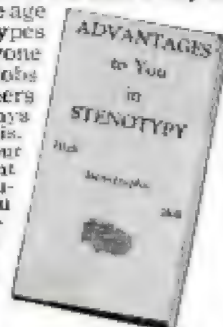
Reference..... P.M.

TO YOUNG MEN— STENOTYPY THE WAY TO SUCCESS

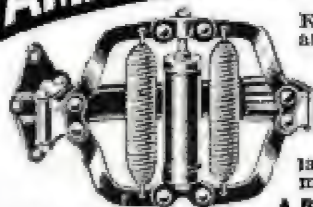
Stenotypy, the new profession, offers unusual opportunities to ambitious young men. It's a man's way of recording speech in this machine age—a silent little machine that types plain print letters faster than anyone can talk. It opens up preferred jobs now—leads to executive careers later. One of the surest, quickest ways to get into Business on the right basis.

Now you can learn Stenotypy in your spare time. Low cost—convenient terms. Get full details. Write for valuable free booklet, "Advantages to You in Stenotypy," describing the unusual opportunities for young men in this growing field and telling how you may enter it successfully. Write Dept. 1204-ST.

THE STENOTYPE COMPANY
4101 S. Michigan Ave., Chicago 11.



Stop Slamming Doors AMAZING MONEY MAKER!



Kant-Slam Door Check is an amazing new invention that closes all doors silently and automatically. Closing speed easily adjusted by turning screw at top of check. Holds doors open when wanted open. Operates on new oil principle. Low priced. Everlasting. Easily installed in ten minutes. Never needs attention.

A Real Demonstrator Furnished Every Agent. You get orders quickly demonstrating actual sample on way to carry business door. Every office, factory, store, institution, and public building needs a Kant-Slam for every door. Rush name and address for details of amazing money-making opportunity. **KANT-SLAM DOOR CHECK CO.** Dept. 2-51, Bloomfield, Ind.

MONEY-MAKING OPPORTUNITY

For men of character. Over \$1,600 per month earned by California man. Over \$400 a week by Georgia man. \$1,000 in a month by Delaware man. Exclusive franchises available for an invention expected to replace a multi-million dollar industry. Install on free trial. Sells itself. Repents. Exclusive proposition. Write F. E. Armstrong, Dept. 1112-N, Mobile, Alabama.

\$ AGENTS 500% Profit SIGN LETTERS

For Store Fronts and Office Windows. Anyone can put them on. Free samples. Liberal Offer to general agents.

METALLIC LETTER CO., 438 N. Clark St., Chicago

EARN THE DEGREE

Doctor of Psychology (Ph.D.), Philosophy, Science, General Courses—Art, Law, Engineering, etc. "CHARTERED BY STATE OF MONTANA." FREE Bulletin.

Temple Bar College, Dept. 2-R, 213 East Main Street
Missoula, Montana, U. S. A.

DEAF? AMAZING NEWS!

You may hear like normal again!
Amazing new instrument releases deaf from misery and embarrassment
Save \$45.00 to \$135.00 and More!

The Godsend, new Scientific, Electrical Hearing Aid is guaranteed to give you same power to hear as instruments costing 3 to 5 times more. Now you may enjoy sermons, lectures, conversations, radio, movies. Complete with Microphone, Super-Power Amplifier, Batteries, and TWO Appliances for BONE or AIR CONDUCTION, both for less than the usual price of only ONE. Music and words heard distinctly from all directions, at close range or from distances. No distortion. Instrument is light-weight, easily concealed in clothing, no more noticeable than pair of glasses. 10-day TRIAL OFFER and MONEY-BACK GUARANTEE. Write quick for FREE DETAILS, sent in plain envelope.

GODSEND COMPANY, Dept. C-488
4204 Davis Lane, CINCINNATI, OHIO

When writing please mention Popular Mechanics

NOW ANYONE CAN LEARN TO PLAY MUSIC THIS QUICK EASY WAY

New simplified home-study method ends gambling and guess-work—over 700,000 students.

Fraction of the cost of old way methods

IT'S surprising to discover how many folks have learned to play music this new, quick, easy way—people who you imagined had practiced for years and spent huge sums on personal teachers' fees. Yet up to a short time ago they were in the same position as you are today.

You, too, can learn to play real music. And you won't need a private teacher, either. You'll learn all by yourself—right in your own home. And best of all the cost is only a small fraction of what it used to cost by old-fashioned methods.

More than 700,000 have studied this U. S. School of Music way. It is easy as A-B-C. No special talent is required—no previous musical training. You learn to play from real notes—the same as those used by accomplished musicians. The best part of it

all is that it is so simple—so crystal clear—so easy to understand. It's all right before you in print and pictures. First you are told how to do a thing. Then a picture shows you how to do it. Then you actually do it yourself and hear it.

FREE Booklet and Demonstration Lesson

So that you may see for yourself how easy, how pleasant it is to learn by this modern, simplified method.

LEARN TO PLAY BY NOTE

Piano Guitar
Violin Saxophone
Organ Mandolin
Tenor Banjo
Hawaiian Guitar
Piano Accordion
Or Any Other
Instrument

Learn to Repair, Adjust, Test and Renew all

AUTOS
Good pay in Auto Work now. Learn at home in spare time with Dyke's famous training and "Self Starter". Nothing else like it. Complete with 85 lessons comprising 1593 pages, 2300 questions and answers and more than 4000 illustrations. Amazing value at \$6.95. Write for FREE descriptive folder.

Goodheart-Willcox Co., Dept. 29, 2009 Michigan Ave., Chicago

Improves Handwriting In 3 Hours

Marvelous invention. Corrects poor writing in few days. Amazing results guaranteed. No failures. Positive proof and complete outline mailed FREE. Write quickly.

OZMENT INSTRUCTION SERVICE, Dept. 34, St. Louis, Mo.

Learn Public Speaking

At home—in spare time. Many overcome "stage-fright," gain self-confidence and increase earning power, this easy way. Write for free booklet, *How to Work Wonders With Words* and requirements.

North American Institute, Dept. 1359
3601 Michigan Ave., Chicago, Illinois

OLDEST WEST BIG
POULTRY PAPER 12 ISSUES 25c

Paste or pin this ad on a letter with your name and address and mail it to us with 25c. (stamps or coin) for the next 12 issues. American Poultry Journal
532 So. Clark Street Chicago, Illinois

MAN IN EACH TOWN To Plate Auto Parts

Reflectors, Bicycles, Fixtures, Mirrors, by late method. Simple plan of manufacturing at home starts you IN GOOD PAYING BUSINESS. Write today for FREE particulars and proofs.

Ave. M **GUNMETAL CO.** Decatur, Ill.

EASY AS A.B.C.



"HERE'S THE EASY WAY I LEARNED TO PLAY MUSIC"

the U. S. School of Music has prepared an Illustrated Booklet and typical Demonstration Lesson which are yours for the asking. They explain fully the principles of this remarkable method and how it enables you to become a popular musician in a surprisingly short time, at a cost of only a few cents a day.

If you are really serious about wanting to learn music—become popular—send for this Free Booklet and Free Demonstration Lesson. Act now! Instruments supplied when needed, cash or credit. U. S. School of Music, 712 Brunswick Building, New York, N. Y.

U. S. SCHOOL of MUSIC
712 Brunswick Bldg., New York City

Send me your amazing free book, "How You Can Learn Music in Your Own Home," with inspiring message by Dr. Frank Crane; also Free Demonstration Lesson and particulars of our easy plan.

Name.....

Address.....

Have you

Instrument.....Instr?.....

TRAIN FOR
ELECTRICITY IN 12 WEEKS
BY ACTUAL WORK ON MOTORS, GENERATORS, ENGINES Etc.
PAY TUITION AFTER GRADUATION



I'll Finance Your Training!

Mail coupon today for details of my "Pay after graduation plan" and famous Coyne "Learn by Doing" method of practical shop training for quick success in this big-pay field. Age or lack of money need not hold you back... Get training first then take 15 months to complete small monthly tuition payments starting 3 Months after you begin training.

LEARN IN 12 WEEKS

Coyne Training is practical, thorough, easy to grasp... you learn quickly by doing actual jobs on real electrical machinery—NOT from books or printed lessons. You don't need previous experience or a lot of book learning. Expert instructors guide you every step of the way. Start any time.

EARN WHILE LEARNING— JOB HELP AFTER GRADUATION

Big things ahead in Electricity mean steady jobs, good pay, and a real future in this fascinating "live" industry. Thousands of opportunities. Rush the coupon TODAY for Big Free Book with hundreds of photos of the great Coyne Shops in Chicago, facts about Coyne Training... Free Employment Service... many earn while learning... additional instructions in Diesel Engines, Electric Refrigeration and Air-Conditioning at NO EXTRA COST and amazing Pay-Tuition-After-Graduation Offer.

COYNE ELECTRICAL SCHOOL
H. C. LEWIS, President
500 S. Paulina St., Dept. 97-72, Chicago, Ill.

Learn
by
Doing

H. C. LEWIS, President, Coyne Electrical School
500 S. Paulina St., Dept. 97-72, Chicago, Ill.

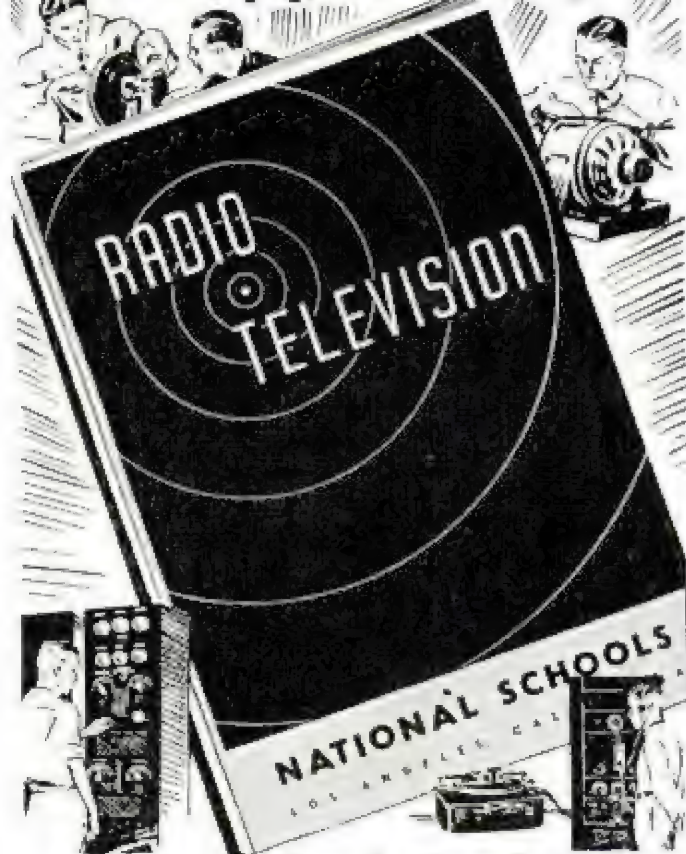
Send me without cost or obligation, your Big Free Book and details of Pay-Tuition-After-Graduation-Offer.

NAME.....AGE.....

ADDRESS.....

CITY.....STATE.....

Get the FREE Book of opportunity



Brimful of terse instructive facts about **TELEVISION RADIO SOUND RECORDING ELECTRICITY**

Note These Interesting Contents

Written in plain, understandable language, this free Book gives facts you want to know about the best-paying trades and opportunities. 95 illustrations. Major subjects include Television Theory and Construction, Pick-up Systems, Amplifiers, Transmitters, Receivers, Cathode Tubes; Radio in all its branches, Receiving, Broadcasting, Trouble-shooting, Construction and Theory; Sound-recording on Disc; Loud Speakers, Talking Picture Projection, Radio Communication, Laws, etc. This book also tells how you can qualify for these good pay trades by training at NATIONAL SCHOOLS. Send coupon now for free book.

National Schools is the oldest trade institution in the West. Established 1905. You can earn room and board while learning. Coach railroad fare allowed to Los Angeles. This service only for residents of U.S.

**MAIL FOR
FREE BOOK**

**NATIONAL
SCHOOLS**
LOS ANGELES

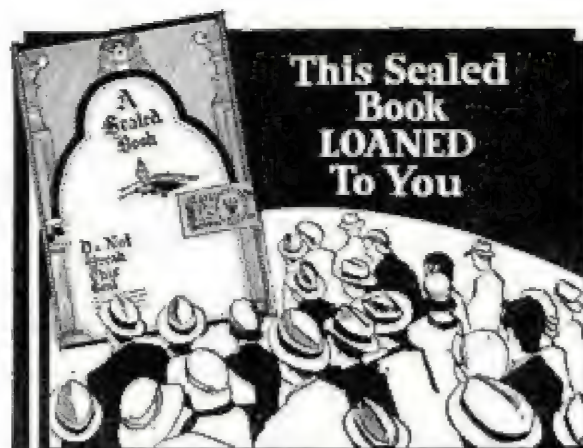
NATIONAL SCHOOLS, Dept. 12-PMR,
4000 So. Figueroa St., Los Angeles, Calif.

Without obligation send your free book.

Name..... Age.....

Address.....

City..... State.....



THOUSANDS EVERYWHERE ACCLAIM THIS **New Psychology Of Life!**

Have you unrealized hopes? Does the tomorrow of your ambitions and desires never seem to come? Are the better things of life always just beyond your reach?

Times have changed—but have you? Change your old form of thinking. Adopt a new psychology of life and MASTER YOUR PROBLEMS. It takes no greater mental effort to achieve results when you know how.

Let the Rosicrucians show you, as they have thousands of others, how by the use of simple laws you can apply the same powers of your mind to bring about startling changes in your life. If you are sincere in your desire, address a letter for the free Sealed Book. It will point out how you may obtain this most helpful information. Address: Scribe A.T.P.

The Rosicrucians
-AMORC-
SAN JOSE, CALIFORNIA.

Perpetuating the Ancient Rosicrucian Secret Teachings

THERMOSCHOOL

Men engaged in work related to steam or Diesel power plants, gas engines, air compressors, refrigeration, air conditioning or any phase of heat engineering, who wish to prepare for advancement in their own field, will be interested in a low cost home study course designed for their special requirements. Stick to your field. Build on past experience. For particulars, send name and address now to
THERMOSCHOOL, Box 302, LEXINGTON, KY.

JOBS for PHOTO-ENGRAVERS!!

EARN WHILE LEARNING PHOTO-ENGRAVING IN SPARE TIME—Photo-Engravers are needed to operate Tascope Photo-Engraving Equipment we sell to publishers everywhere... Start training at home in spare time. We furnish all equipment including photo-engraving camera with lamps, lens and screen. Earn while learning by making engravings for local advertisers, newspapers, printers, etc. Copper plate for picture shown here, size 8x10 inches sells for \$15.37. SEND TODAY for job plan details and catalog illustrated with pictures engraved by equipment we furnish. No cost! No obligation.

THE AURORA SCHOOL OF PHOTO-ENGRAVING
Dept. 112 Aurora, Missouri

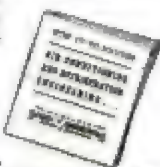


AIR CONDITIONING AND ELECTRIC REFRIGERATION INDUSTRY NEEDS TRAINED MEN

34-year-old organization now receiving applications of men to prepare for positions in Air Conditioning and Electric Refrigeration. Quality in 3 months for Estimating, Installation, Service, Maintenance and Sales positions. No experience needed—we train you under actual working conditions in our own air conditioned laboratories. Free employment service. Get free book "Step Up to Success"—just off the press. Write

**MILWAUKEE
SCHOOL of ENGINEERING**

1020-L North Broadway, Milwaukee, Wis.



The Whole Field of Practical MATHEMATICS IN ONE VOLUME

**NEW
Enlarged
1,000
PAGES**

Contains more valuable mathematical information than any other book. Instant facts and formulas. Needed in every business, trade, or home workshop. Examine 5 days Free. Then pay \$2 per mo. for 3 months or return book and owe nothing.

D. Van Nostrand Co., 250A-4th Ave., New York

New York Electrical School

Established 1902

Ask for free booklet

44 West 17th St., N. Y. C.

DIESEL

Get BETTER training. Realize ADVANTAGES. Located in Pacific Northwest, a Diesel center. Established 28 years. Modern equipment, expert instructors. Close cooperation for YOUR success. Earn room and board while learning. Send for FREE big 40-page Diesel School Catalog No. 18. Home Study and Resident Courses.

L. L. ADCOX TRADE SCHOOL

Portland Oregon

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC. REQUIRED BY THE ACT OF CONGRESS OF MARCH 3, 1907, of Popular Mechanics Magazine, published monthly at Chicago, Ill., for October 1, 1937.

State of Illinois, County of Cook, ss.

Before me, a notary public in and for the state and county aforesaid, personally appeared Willis S. Brown, who having been duly sworn according to law, deposes and says that he is the Business Manager of the Popular Mechanics Magazine and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations printed on the reverse of this form, to wit: First, That the names and addresses of the publisher, editor, managing editor, and business manager are: Publisher, Popular Mechanics Co., 200 East Ontario St., Chicago, Ill., Editor, H. H. Windsor, Jr., 200 East Ontario St., Chicago, Ill., Managing Editor, L. K. Weber, 200 East Ontario St., Chicago, Ill., Business Manager, Willis S. Brown, 200 East Ontario St., Chicago, Ill., Second, That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.) Popular Mechanics Company, 200 East Ontario St., Chicago, Ill.; L. K. Windsor, 200 East Ontario St., Chicago, Ill.; H. H. Windsor, Jr., 200 East Ontario St., Chicago, Ill.; L. H. Windsor, 200 East Ontario St., Chicago, Ill., Third, That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None. Fourth, That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him. Willis S. Brown, Business Manager. Sworn to and subscribed before me this 24th day of September 1937. J. GRAHAM, Notary Public. (My commission expires June 16, 1940.)

BE YOUR OWN BOSS

Adjust, repair, typewriters, adding machines. Offices, factories, stores. Learn at home from factory expert. Good men can earn up to \$15 daily. Complete instructions all makes only \$3.00 postpaid or sent C. O. D. in U. S. Money returned if not satisfied. Send today. **ADDING MACHINE EQUIPMENT SERVICE, 3601 Michigan, Dept. 1353, Chicago.**

do-it-with-squabs



Easily and steadily raised in 25 DAYS. Write a post-card, get **FREE EYE-OPENING Picture Book**. Why breed for ordinary trade when these great **luxury** national markets are wide open for all the **SQUARES** you can ship, every day in the year? We give a large bonus in stock for promptness.

RICE FARM, 636 H St., Melrose, Mass.

"GIVE ME YOUR MEASURE AND I'LL PROVE IN THE FIRST 7 DAYS YOU CAN HAVE A BODY LIKE MINE!"

No other Physical Instructor in the World has ever DARED make such an offer!

I'LL give you PROOF in 7 days that I can turn you, too, into a man of might and muscle. Right in the first week you will see and feel the improvements! Then I continue to rebuild, renew and "overhaul" your body. Soon you are the proud owner of a powerful build like mine. People will notice the ruddy glow of health in your face, the sparkle in your clear eyes, the breadth of your shoulders. You will be the fellow who will walk off with the prettiest girl and the best job. Mail coupon below for a FREE copy of my new book. It reveals the secrets that changed me from a 97-pound weakling into a husky who won the title of "The World's Most Perfectly Developed Man."

Are you underweight? I'll add pounds where needed! Are you fat in spots? I'll pare you down to fighting trim!

And I'll also give you rugged health that banishes constipation, pimples, skin blotches and similar conditions that rob you of the good things of life!

I haven't any need for contraptions that may strain your heart and other vital organs. I don't dose you or doctor you. **Dynamic Tension** is all I need. It's the natural tested method for developing real men inside and out.

48-Page Book FREE

Tells all about my method and what it has done to make big-muscled men out of run-down specimens. Shows, from actual photos, how I develop my pupils to my own perfectly balanced proportions. My system can do the same for you too. Don't keep on being only half of the man you CAN be! Put your name and address on the coupon, or a postcard, and mail it today. **CHARLES ATLAS, Dept. 812, 115 East 23rd Street, New York, N. Y.**

**CHARLES ATLAS, Dept. 812
115 East 23rd Street, New York, N. Y.**

I want the proof that your system of Dynamic Tension will make a new man of me—give me a healthy, husky body and big muscle development. Send me your free book, "Everlasting Health and Strength."

Name..... (Please print or write plainly)

Address.....

City..... State.....



Actual photo showing how **CHARLES ATLAS** Looks TODAY



Big Silver Cup Being Given Away

This valuable solid sterling silver cup stands about 14 inches high. I will award it to my pupil who makes the most improvement within the next 3 months. Therefore, no matter what your measurements may be now, you have an equal chance to win this cup—with YOUR name engraved on it!

ACCOUNTANCY

One of America's best paying professions



These Are

OPPORTUNITY DAYS for the Trained ACCOUNTANT!

WITH new state and federal legislation requiring more accurate accounting from businesses than ever before, the trained accountant is certainly a man to be envied. Much in demand, member of "America's best-paid profession," an important figure in affairs, he is one of the most influential and necessary individuals in the whole business scheme!

This is a profession YOU may be considering at this moment. If so, don't fail also to consider critically how, when, and from whom you will secure your Higher Accountancy training. Consider particularly LaSalle's record of more than 500,000 Accountancy-trained men and women during the past twenty-nine years—a record unsurpassed by any other educational institution in the world!

Remember, too, how numerous are the available accountancy schools and courses in the country. Yet, despite this fact, approximately one-tenth of all C.P.A.'s have been trained or coached by LaSalle.

As to the training itself, you will find it absolutely complete; from Elements through to Accounting Systems, and a choice of twelve post-graduate electives, including C. P. A. Coaching that qualifies you thoroughly.

Spare-time study does it all! No interference with your present work—no expensive resident-school costs—and a careful analysis of thousands of student histories reveals that many have realized, in increased later earnings, as high as \$50 returns on every hour devoted to such study.

If you are actually in earnest—are willing to work devotedly for your future success, look into this subject carefully, thoughtfully, and from every angle. Full information and a 64-page survey of this opportunity field will be sent you on request.

Sign and mail coupon for complete details

LaSalle Extension University

Dept. 1264-HR

Chicago

Kindly tell me more about the present opportunities in Accounting and how your training can help me grasp them. Also send me—free—your booklet on "Accountancy, the Profession That Pays."

☐ Higher Accountancy

Other LaSalle Opportunities:

If more interested in one of the fields indicated below, check and mail now.

- ☐ Business Management
- ☐ Modern Salesmanship
- ☐ Law—Degree of LL. B.
- ☐ Commercial Law

- ☐ Expert Bookkeeping
- ☐ C. P. A. Coaching
- ☐ Business English
- ☐ Stenotypy



Name

Present Position

Address

Increase Your Earning Power

Apply time and labor-saving kinks to your work. Your efficiency will soon be recognized and you will be in line for advancement.

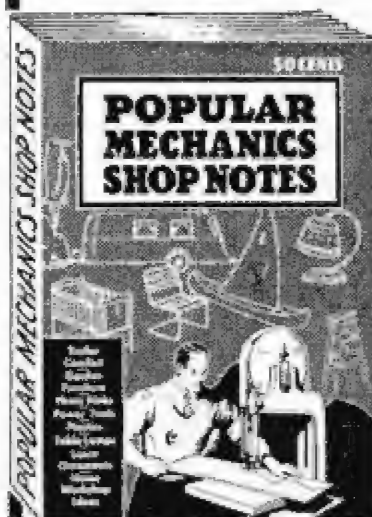
If you do machine shop work of any kind, sheet-metal work, painting, carpentry, auto repairing, farming, concrete work, plumbing, electrical work, welding, building-glass work, general repairing, tool-making, poultry raising, masonry or home repair work, get this

LIBRARY OF 2400 TIME AND LABOR SAVING IDEAS FOR SHOPMEN AND HANDYMEN

JUST OUT

SHOP NOTES for 1938

318 Articles
645 Illustrations
224 Pages
Price 50c
See partial list of
contents below



Including the new 1938 issue illustrated above, there are six volumes in the Shop Notes Library of 2400 easily understood short cuts to every-day jobs. Here are just a few of the subjects taken from the latest issue:

- | | | |
|-------------------------|-------------------------|-------------------------|
| Are Welder, Auto Motor | Garden Furniture, Metal | Plastic Ornaments |
| Buns | Gas Engines, Midget | Sail Rig, Airstream |
| Bits, Wood-Boring | Hacksaws, Electrically | Sander, Oscillating |
| Cabinet Humidifier over | Drives | Saw, Power-Driven |
| Radiator | Hydraulic Rams for | Table |
| Carpenters, Hints for | Country Homes | Shaper Projects |
| Child's Crib | Jigs for Belt Sander | Snow Plow, Small Rotary |
| Corrosion, Guarding | Jigs for the Shaper | Table Lamps from Plas- |
| Against | Kinks for Photographers | tics and Metal |
| Drill, Safe | Ladder Chair | Temperature Indicator, |
| Drills, Using | Laundry Cart | Electric |
| Driveways, Durable | Lawn Ornaments | Trailer Hooks, Vacuum |
| Electrifying | Movie Film, Power Reel | Trailer Comfort |
| Frozen Water Pipes, | for Developing | Turn, Electric Arc |
| Thawing Electrically | Photographic Equipment | Wood Turning Kinks |
| Garage, Profit Makers | | |
| for | | |

Each volume contains approximately 400 articles and 600 illustrations and has 200 or more pages. This unrivaled library of shop helps may be secured for a limited time only. After the present supply of books is exhausted the offer must be withdrawn.

Send No Money

POPULAR MECHANICS PRESS,
200 E. Ontario St., Room 1237, Chicago, Ill.

Send me, as per your offer, the following books. I will pay postman price and small amount of postage. My money will be refunded if I am not satisfied. (Check what you want.)

- ☐ 1938 Shop Notes and Lathe Handbook (Metal Working), both for 98c.
- ☐ Shop Notes Library (6 vols.) \$3.00.

Name

Street and No.

City

State

*C. O. D. applies to U. S. and possessions only. If you reside elsewhere, remittance must accompany order.



CLASSIFIED Advertisements



Advertisements in this section, 35 cents per word, each insertion, minimum 10 words, payable in advance
To be inserted under proper classification in January issue, copy should be in our office November 8th
January issue on sale December 1st

Popular Mechanics Magazine, 200 East Ontario Street, Chicago, Illinois

YOU'LL PROFIT

By reading and answering the classified ads in this section. Hundreds of opportunities to make and save money.

AUTOMOBILES

SEMI-DIESEL. Principles of. Text book. Including 8 popular conversions in detail. Charts, drawings, definitions, trouble shooting. Price \$1.50. Semi-Diesel Research Publications, Redondo, Calif.

1937 IGNITION Supercharger. Quick starting, wet or cold. Mileage, pep, power, less carbon, \$1.25. E. G. Sales Co., 321 Broadway, New York.

CONVERT Ford motor into fast pumping air compressor. Instructions \$1.00. Tuck Garage, 73 Shirley, Pontiac, Michigan.

ECONOMY! Performance! Mileage! Semi-diesel conversions for all gasoline motors. \$5 up. Deal direct with the manufacturers. Unconditional written guarantee. Special complete units for Ford and Chevrolet. Learn basic facts. Illustrated literature free. Des-A-Gas, 1719 Addison, Berkeley, Calif.

MIDGET Racing car. 100 miles-per-hour. Build with our plans, parts. Information for stamp. Shipp's Midgets, Box 543-H, Zanesville, Ohio.

DIESEL Engine trouble shooting and maintenance simplified. Original method, complete with charts and explanations. One dollar postpaid. Western Diesel Service, 2123 South Prairie, Chicago, Ill.

MIDGET Autos! Motors! Used motors for sport midgets, \$4.00 up; for racers, \$10.00 up. Over 60 different motors, also used midgets, parts. Lists, 20c. Shipp's Midgets, Box 543-H, Zanesville, Ohio.

LUBRICATION Information. Diesel, aviation, truck, tractor, graphite, filters. Worth many dollars, book 50c now. Brace, 234 No. Broadway, Milwaukee, Wis.

FORDS Given '37 type brakes \$2.25. Information free. Crandall Parts Co., 452 W. 19th, Houston, Texas.

(POWERFUL) Leaky radiator sealer. (Harmless.) 40c coin. Agents wanted. E. O. K., Porterville, Calif.

MIDGET Cars, parts, plans. Catalog dime. Derby Midget Cars, Woodstock, Ill.

R & R Mfg. Co., Anderson, Ind. Racing cars and midgets. Catalogue 25c.

FORD V-8's, 1935-36-37: Increases mileage. \$1. Walert Co., 3429 N. 10th St., Milwaukee, Wis.

DESOGAS Fuel oil converters \$4 up. Pretti Desogas, 1618 6th, Berkeley, Calif.

AUTO SUPPLIES AND EQUIPMENT

CONVERT Your car to burn Diesel oil. Save up to 70% fuel costs. Cheap installation. Wonderful performance. Proven factory method. Different and better. Costs nothing to investigate. Write for free circular No. 4. Harrington Company, 201-204 Manchester Building, Portland, Oregon.

Popular Mechanics Magazine,
200 East Ontario Street, Chicago, Ill.

Dear Mr. Johnson: It may interest you to know that I have used the classified pages of Popular Mechanics magazine since 1909, the quarter century mark having been passed, and as I see it recede, I find myself looking forward also, toward the third of a century milestone. I don't know whether it is a hobby, or a mania with me, but I have always kept close statistics, and found Popular Mechanics, in season or out of season, to be a steady puller, bringing in replies at a low advertising cost per answer, and the volume of resulting cash sales of a highly satisfactory order. With best personal wishes, I remain

Very cordially yours,

JOHN D. PAYN.

(Original letter on file in our office)

PARK Without being tagged. Parking cards for restricted areas. Any city. Mail dime and stamp. Doody, Kendrick St., Brighton, Mass.

AUTO Parking mirror. Saves fenders, hub caps, tires. One dollar postage paid U. S., add fifteen cents Canada. W. G. Hara, 2403 Budlong Ave., Los Angeles, Calif.

FREE. Bargain catalogue. Wholesale, auto supplies, equipment. Lefte, 1189 Bedford Ave., Brooklyn, N. Y.

DEMONSTRATORS. Compressor, test bench, 8-hour battery charger, arc welder. Guaranteed. Trial and terms. Hobart Welder Exchange, Box M-1271, Troy, Ohio.

GASOLINE Consumption gauge. Economizer mechanically measures rate of gasoline consumption at carburetor. Electric dash gauge. Econometer Co., Plain, Wis.

CURE Oil pumping. Restore pep, power. Increase gas, oil mileage. Easily installed segment rings, piston expanders. Guaranteed. Agents wanted. Haling, 4750A Sheridan, Chicago.

PLATING Outfits for auto parts. Connect to a battery. No tanks used. Free particulars and proofs. Gunmetal Co., Ave. J, Decatur, Ill.

AUTO TRAILERS

BUY Or build telescoping house trailer. A wonder. Write Karkabin, Fairfield, Iowa.

TRAILER Builders! Everything at bargain prices! Write for free catalog. Easy to build 16 foot de luxe trailer plans—10c. National Trailer Equipment Company, 714 W. Wisconsin Avenue, Milwaukee, Wis.

BUILDERS—A big 68 page book, tells all about trailers. How to plan and build the latest modern designs. Complete instructions, how to select and where to get dependable material and supplies. 350 illustrations, over 500 new and improved parts and accessories. Every phase of trailer construction is dealt with. The book is compiled by engineers engaged in trailer building. Send 25 cents, coin or stamps to cover postage and mailing. A. J. Stephens & Co., 2803B E. 14th St., Kansas City, Mo.

BUILD The famous Jim Dandy cabin trailer—thousands on the road! A roomy, good looking trailer easy to build at low cost by anyone handy with tools. Complete plans and instructions—only 50c—give every detail of chassis, body, top, beds, cabinets, refrigerator, electric light and water systems and where to buy all parts. Can be built in any size to accommodate 2 to 4 people. Send 50c for these practical plans. Rush your order today to Jim Dandy, Box 1125, Wausau, Wis.

PARTS For the Popular Mechanics "Family Trailer" featured in the February, March and April, 1936 issues. Everything you need—Axle, hitch, wheel housings, water tank, pump, toilet, sink, stove, wood parts, windows, screens, lights, cushions, etc. Send for price list. Include 25c for our big catalog and Trailer Builders' Manual. Trailer Supply Co., 411 Jackson St., Wausau, Wis.

A. C. GENERATORS

PRACTICAL Changes for automobile generators. See our advertisement at bottom of page 139A. Autopower.

MOTORCYCLES, BICYCLES AND SUPPLIES

INSIDE Dealer prices. Overstocked, all models, Indians and Harleys. Rebuilt, guaranteed. Dime brings latest list. Crandall-Hicks, Boston, Mass.

NEW Free Catalog just out, used Indians, Harleys, Auto-Glide motor scooters, Servi-Cycle light motorcycles \$29 down. Motorcycle speed books \$1.50 each. Diesel books, goggles, stop watches, helmets, Hepolite speed pistons. American, foreign auto and motorcycle racing publications. Clymer Motors, Dept. P.M., 434 West Pico, Los Angeles, Calif.

RECONDITIONED Motorcycles. New—used parts for all makes. Authorized Harley-Davidson dealer. Whitman Motorcycle & Supply Co., 405-9 Southwest Blvd., Kansas City, Mo.

SEND 15c For illustrated used motorcycle catalog. Bargains. Largest stock genuine Indian parts and motorcycles. Indian Motorcycle Sales, Kansas City, Mo.

REBUILT Motorcycles, all makes, new and used Harley-Davidson parts. Send 10c for bulletin. Western Harley-Davidson Distributors, 914 E. 15, Kansas City, Mo.

MOTORCYCLE Bargains, lowest prices, bargain sheets for stamp. Motorcycle accessories. Rochester Harley Davidson Corp., 129 W. Main St., Rochester, N. Y.

ALLOY Pistons—Harley, Indian, Henderson, Excelsior, new or used parts, cylinder grinding. Catalogue and wings pin 10c. Ballak, 1115 Chestnut, St. Louis, Mo.

AVIATION

PROPELLERS For airplanes, sleds. Also ice sled blueprints. Catalog dime. Lorenzen Propellers, Niles, Mich.

SLED Propellers—Harley \$2.98, Henderson \$4.50, Fordchev \$7.50. Catalog free. Standard Propeller Co., Fort Worth, Tex.

AIRPLANES \$50 Up. Motors, crackups, salvage. Complete directory 25c postpaid. Used Aircraft Directory, Athens, Ohio.

SKY Flyer. Four foot model. Rises 2000 feet. Stays for hours. Assembles in twenty minutes. 50c postpaid. No stamps. Hare Products, Whitinsville, Mass.

YOUNG Men interested in entering aviation under apprentice plan see ad on page 20A.

PROPELLERS—Airplanes, sleds, boats, generator, fans. Aircraft supplies. Save 50%. List free. Universal Aircraft, Fort Worth, Tex.

GET INTO aviation. Air transport pilots get up to \$7,000 per year; mechanics \$2,500. Learn at this government approved school. Write for complete information. State age. Lincoln Flying School, 2004 Aircraft Bldg., Lincoln, Nebr.

BATTERIES, GENERATORS, ETC.

MAKE Your own generators. Hundreds of applications. Write for circular. Autopower, Midwest Station, Chicago.

MAKE Money. Rewind auto generators. Full instructions 50c. Also material. Ernest Knight, LaSalle, Illinois.

BUILD Powerful electric plant from washer engine, automobile generator. Instructions 50c. Electric Manufacturing, St. Paul, Minnesota.

EDISON Lifetime storage batteries for light and power. Eliminates acid battery diseases. Long guarantee. All kinds rebuilt generating plants, motors, and miscellaneous articles at bargain prices. Free interesting literature. T. Hawley Smith Co., Croton Falls, N. Y.

EDISON Storage batteries for light-power systems. Non-acid. Odorless. Fifteen year life. Five year unconditional guarantee. Bargains in complete lighting systems. Low prices. Free illustrated literature. "See-Jay" Battery Co., 82 Sterling Ave., Yonkers, N. Y.

ELECTRICAL SUPPLIES—EQUIPMENT

ELECTRICAL KIT. \$1.49! Make arc light mile range. Arc furnace. Melt glass, metal. Weld iron, brass. Sun-tan rays. Dozens others. Complete with goggles, instructions. Works from house light current. Electrical Salvage Co., Box 524-A, Lincoln, Nebr.

ELECTRICIANS. Build lamp annunciator business, free data. Kirkland Co., Morristown, N. J.

HUNDREDS Of new, unusual, hard-to-get electrical items, replacement parts and supplies. Send for free wholesale catalog. Autopower, 410 S. Hoyne Ave., Chicago.

CUT Coal bill. New Delco draft blowers for any furnace \$10. Thermostats \$4. Serv-AI Products, Schenectady, N. Y.

ELECTRICAL Goods, watches, gifts. Send for catalog. Illinois Mail Order House, 6717 West North Ave., Oak Park, Illinois.

MAGNET Lifts 50 times own weight. Recover lost articles. \$1.00 postpaid. Particulars stamp. Amfadco, 861, Minneapolis, Minn.

ELECTRIC Pen engraves all metals, dollar prepaid. Hudson Bros., East Syracuse, N. Y.

WELDING AND SOLDERING

BUILD Welders and soldering pliers, a.c. or d.c. Write for free circular. Autopower, Midwest Station, Chicago.

SOMETHING New—110 volt electric brazing torch. Produces a 3 inch flame similar to an acetylene welder. Requires no gas or upkeep. Ready to use at the turn of a switch. Will last for years. Complete with all accessories—\$12.50. Dept. B, Apollo Mfg. Co., 319 Union Ave., Memphis, Tenn.

GENUINE Dodge arcwelder economically built without rewinding. Plans \$1. Particulars free. Pullis, Booker, Texas.

WELDER Shortage. Big day. Finest training and employment help. Wonderful climate. Folder. Dunn Welding School, 1308 N. E. Union, Portland, Oregon.

DEMONSTRATORS. Electric arc welders. Money-saving prices. Used by the government. Trial and terms guaranteed. Hobart Welders, M. 1273, Troy, Ohio.

REBUILT 100 Ampere Dodge arc welder generator \$15.00. Neal Brown, Richland Springs, Texas.

REBUILT Electric arc welders, all sizes, a.c.—d.c. Service Co., 3732 Cedar Ave., Cleveland, Ohio.

DODGE Arc-welder. Build your own with ready made parts or make them yourself. Use old North-East. Dodge 12 volt automobile generators, convert to 40 volt, 25-200 ampere direct current arc-welders. Low cost and upkeep. Results guaranteed. Certified instructive plans \$1. COD. \$1.12. Air mail 12c extra. Welders Club of America-A. Box 3432, Chicago.

ACETYLENE And electric welding equipment. Box 331, Hamilton, Ohio.

ENGINES, MOTORS, DYNAMOS

BARGAIN—1/4 Hp. motors, 60 cycle, 1 phase, 110 volt, like new, guaranteed, \$8.25. Send check to Erie Electric Motor Co., 120 Church, Buffalo, N. Y.

SMALL Elect. motors, high speed, 1/10 h.p., 110 volts, universal, rebuilt, \$2.00 postpaid. McConnell, 1619 Edgewood, Racine, Wis.

GOVERNORS For auto engines. Read our ad on page 134A. Mfg. Candee-Smith Governors.

GUARANTEED Rebuilt and new motors, generators, fans. All kinds and sizes. Very reasonable prices. Tell us your needs. Queen City Electric, 519 S. California, Chicago.

WINDING Data, 325 motors, single and three phase. Price \$1. Motor Data Co., Box 7631, Kansas City, Mo.

MACHINERY, TOOLS AND SUPPLIES

FREE—Bargain catalog, handy electrical tools, drills, motors, machinery, accessories; for mechanics, craftsmen. Paramount Products, 245A Broadway, New York.

A COMPLETE Set of sharp retreating files for your workshop. 10" flat mill and half round, 12" square, round and flat mill and 8" triangular. All for only one dollar. New Method File Co., 5120 So. Halsted St., Chicago, Illinois.

LATHE (Hardinge) bench type, repaired by experts 25 yrs. practical experience. Collects furnished for any make machines. Northwest Machine Co., Inc., 4533 Diversey Ave., Chicago.

BARGAINS. Demonstrators, electric arc welders, guaranteed, 30 days trial and terms. Write Hobart Welder Exchange, Box M-1273, Troy, Ohio.

15" x 6" SOUTH Bend screw cutting engine lathe, \$175. 14" Steptoe crank shaper \$125. All sizes of machine tools. Cincinnati Machinery & Supply Co., 27 W. Second St., Cincinnati, Ohio.

PLASTICS. Brass, aluminum, Dowmetal, monel, stainless steel, gears, etc. New catalog now ready 10c coin. Hobby Supply House, Box 2014, Pittsburgh, Penna.

BOATS, OUTBOARD MOTORS, ETC.

ICEBOAT Parts \$24.75. Skate sails \$7 up. Try-Sail Co., Patterson, N. Y.

BARGAINS In rebuilt outboard motors. Send stamp for list. Murray Boat Shop, Traverse City, Mich.

BUILD Your boat and save; using our knock down frames. Muller Boats, 4920 Seventh Ave., Brooklyn, N. Y.

BUILD Your own boat with our pre-fabricated frames and materials. They're different. Save 2/3s and costly mistakes. Send requirements for quotations. Illustrated catalog 100 boats, 10c. Bay City Boats, Inc., Bay City, Mich., 1852 Adams St.

KAYAKS. Blueprints. Illustrated catalogue 10c. Viking Kanoe Co., Merrick, N. Y.

BUILD A boat by the original Welch system. Use Welch Ready Cut Parts. Select your boat from our 32 page catalog showing boats of many types; boat kits; marine hardware; motors; propellers; sails, etc. Damaged propellers repaired. Send 10c for catalog. Expert advice on boat problems free. Welch Boat & Supply Company, Station K-1, Milwaukee, Wisconsin.

"NEW Front steering," motor sleds, using outboard or motorcycle engine, snowmobiles, blueprints, kits and supplies. Propellers, counter-shaft. Bargain prices! Rush time for details. Mead Gliders, Dept. 12-BC, 15 S. Market St., Chicago.

AUTOMOBILE Transmission conversions for marine use. High reverse. Complete line Ford model A and B conversion parts. Free catalogue. Walter Machine Co., 75 S. Street, Jersey City, N. J.

ASSEMBLE Your own boat. Our finished knock-down frames save you 2/3 builder's cost. All types and sizes. Send 25c for big catalog. Brooks Boat Co., Inc., D4, Saginaw, Mich.

OUTBOARDS—Save 1/2. Good used parts, all makes and models. Bargains rebuilt motors. Grandall Hicks Co., 789 Commonwealth, Boston, Mass.

FORD Marine conversion parts and kits, Models A, B, V8 (domestic or foreign). Catalogue 25c (coin). Osmithson, 3101 C St., Philadelphia, Penna.

12-FOOT Flat bottom rowboat—complete plans 25c. Free boatbuilding catalog. The Rudder, 15 Murray St., New York.

BOAT Designers are highly paid professionals. Complete course by mail. Catalog. Westlawn, Montville, N. J.

SPORTING GOODS, GUNS, FISHING TACKLE, ARCHERY

FISHERMEN! Tie your own flies. My book tells all. Profusely illustrated. Practical. Finest stock of materials in America. List free. Write, Paul H. Young, 8065-C3 Grand River Ave., Detroit, Mich.

FENCING Equipment. Foils, swords, masks, etc. Low prices. Free catalog. Industrial Products, 274 Madison Ave., New York.

HUDSON Bay blankets, Indian pack baskets, camp stoves, knives, compasses, outdoor equipment. Free catalog. Howe Fur Co., Box P, Coopers Mills, Maine.

ARCHERY. Most delightful sport for young and old. Instruction book 10c. Catalogue free. Archery Sales, 617 S. State St., Chicago.

NATIONALLY Known and advertised guns delivered at bargain prices. Catalogue free. Hoyt's Store, Sac City, Iowa.

SURF Boards for everyone. Circular free. Brainard Buil, P. O. Box 19, Geneva, N. Y.

FIELD GLASSES, TELESCOPES AND MICROSCOPES

ASTRONOMICAL Telescopes, parts, kits. Catalog free. New Telescope Co., 3675 W. 165th St., Cleveland, Ohio.

FREE Instructions. Make powerful astronomical telescope in one evening. Extremely low cost. Atemco, Box 213P, Flushing, N. Y.

TELESCOPES. Microscopes, binoculars. Lowest prices. Optical catalog free. Brownscope Co., 234 Fifth Ave., New York.

FREE Catalog listing microscopes, telescopes, field glasses, chemical and scientific supplies. Send 3c for postage. Kemkit, 397M Bridge St., Brooklyn, N. Y.

BUILD Reflecting telescopes; catalog free. Instruction 10c. Optical Laboratories, Larchmont, N. Y.

TELESCOPES. Microscopes, binoculars, mineralogy, chemistry. Catalog free. Teeko, Evanston, Ill.

USED Microscopes, binoculars, astronomical telescopes, surveying instruments—Bought, sold, repaired. Send 10c for list. Rasmussen, P. O. Box 294, Amsterdam, N. Y.

ANTIQUES, RELICS, INDIAN GOODS

INDIAN Relics, beadwork, coins, curios, minerals. Catalog 6c. Indian Museum, Northbranch, Kansas.

INDIAN Relics—20 arrowheads \$1.00. Free list. Tom Jervas, W. Center, Marion, Ohio.

100 GOOD Arrowheads, \$3. Satisfaction guaranteed. Geo. Holder, Glenwood, Ark.

TAXIDERMISTRY

"MODERN Taxidermist Magazine," Greenfield Center, New York. Taxidermy articles, methods, photos. Two sample copies 25c.

GLASS Eyes. Taxidermists', furriers' supplies. Lowest prices. Forty page catalogue, free. Write today. Elwood Supply Co., 222 Smith Bldg., Omaha, Nebr.

TAXIDERMISTRY Supplies—Quality artificial eyes, teeth, genuine Jonas head forms. Tools, materials, etc. Everything for the progressive taxidermist. Send 10c for big illustrated catalogue. Jonas Bros., 1049 Broadway, Denver, Colo.

TAXIDERMY—Send today for free catalog showing guaranteed taxidermy supplies. Glass eyes, shields, panels, head forms, etc. Taxidermic Mfg. Co., Dept. 5B, Memphis, Tenn.

DOGS, BIRDS, PETS

GOLDEN Choppers \$3.95. 30 varieties finches, canaries. Circular free. Posa's, 1441 The Alameda, San Jose, Calif.

SPORTSMEN: 200 Pointers, setters, straight cooners, combination hunters, rabbit and fox hounds. Cheap. List free. Ramsey Creek Kennels, Ramsey, Ill.

XMAS Gifts that live! Woolly Saint Bernard puppies priced right too! Dime brings photographic particulars. Royal Kennels, No. 8, Chazy, N. Y.

PUPPIES—All breeds. Beautiful sons and daughters of famous show or field trial champions. Prices \$50-\$100. Sold on approval, direct from homes of dog fanciers. McFarlin Service, Delavan, Wisconsin.

SAINT Bernard puppies; ideal Christmas gifts. Paramount Kennels, North Hatley, Quebec.

FLYING Squirrels—Ideal pets. \$3 pair. Shuler Horne, Charleston, S. C.

BIRDS? Get American Canary Magazine monthly. Year, \$1; six months, 50c. 2839-P N. Halsted, Chicago.

BEAUTIFUL Pure white police dogs. Ansonia Kennels, Mose, N. Dak.

POULTRY AND SUPPLIES

FREE Introduction sample, to prove Heers Internal Antiseptic destroys coccidiosis, germs and diseases in poultry. Beresol Laboratories, Lindenhurst, Long Island.

BIG Money in poultry this year. Read Poultry Tribune, the big monthly magazine that tells how leading poultry raisers make money. The only poultry magazine operating its own experimental farm. Five years \$1, one year trial 25c. Poultry Tribune, Dept. E-93, Mount Morris, Ill.

WRITE For new prices on Salem's AA chicks. We pay postage and will ship COD. Salem Hatchery, Rt. 19, Salem, Ind.

FARMS AND FARM LANDS

FLORIDA Farm, oranges, grapefruit, etc.; 2½ acres near salt water fishing, bathing, boating; pleasant 6-room bungalow, electricity, deep well; only 2½ miles to city; bargain at \$1200, terms; picture page 39 free fall catalog. Strout Ag'y, 255-P 4th Ave., New York City.

THE Great Northern Railway serves an agricultural empire of fertile productive farms where rents, prices and operating costs are low in Minnesota, North Dakota, Montana, Idaho, Washington and Oregon. Write for free book and full information. E. C. Leedy, Dept. 1257, G. N. Ry., St. Paul, Minn.

GOVERNMENT Lands ten cents acre up. Information all states twenty-five cents. National Tax Service, 600A Majestic Bldg., Detroit, Mich.

WANT To hear from owner of property for sale or trade. Details free. Real Estate Salesman, Desk B, Lincoln, Nebr.

40 ACRES, Near White River, unimproved; poultry land. \$175, \$5 down, \$5 monthly. Free list and literature, Hubbard, 216 Grossman Bldg., Kansas City, Kans.

NEW Farm opportunities! Washington, Minnesota, Idaho, Oregon, North Dakota and Montana. Farm income advancing but land prices still low. Literature. Specify state. J. W. Haw, 119 Northern Pacific Ry., St. Paul, Minn.

PROFITABLE OCCUPATIONS

"HOW To grow pearls in bedrooms, in shellfish." Booklet dime. Pearl Culturists, Woodland, N. Y.

"FOUR Years With Frogs." Experience arranged in questions and answers describing ponds, vegetation, sex and marketing. Twenty-five cents coin. Lafayette Frog Farm, Lafayette, Louisiana.

INVESTIGATE—A post card may solve your problems. California Earthworm Farms, La Canada, Calif.

MRS. M. earned \$267, three weeks raising mushrooms in cellar! Exceptional, but your cellar, shed perhaps suitable. We buy crops. Book free. United, 3848 Lincoln Ave., Dept. 66, Chicago.

DRIVE To country, movies afternoons! Work mornings home. No canvassing! Follo-H, Station D, Los Angeles.

"RAISE Frogs!" We buy! Good prices year round. Start small pond. Free book shows sketch. American Frog Canning, (153-X) New Orleans, La.

MUSHROOMS: Grown at home with newly patented tobacco stem spawn, for pleasure or profit. Enough spawn to plant 25 sq. ft. and complete instructions sent prepaid for \$1.50; 50 sq. ft., \$2.25. Home Growers Service, Box 62, Dept. D2, West Chester, Pa.

BOOK Service opportunity. Something new and mighty good for book lovers. Every business independent. Room for hundreds of operators. No canvassing. Complete information \$2. Circular free. Julius, Amarillo (15), Tex.

FREE Booklet describes 107 plans for making \$20-\$100 weekly in home or office, business of your own. Elite Co., 214 Grand St., New York.

RAISING Jumbo frogs. Interesting. Big future. Females lay 10,000 eggs. Free literature. American Frog Industries, Box 336, Rayne, La.

RAISE Rabbits and covies for us. We buy at top prices. Complete details in catalog, contract and magazine. 10 cents. Stahl, Box 1, Holmes Park, Missouri.

TREES, SHRUBS, ROOTS, HERBS

HORMODIN—"A" Grows roots on slips, cuttings. \$1.00 postpaid. McBee Chemical Company, 1624-A Boren, Seattle.

JUST Out! World's greatest "Herbalist Almanac." Beautifully illustrated in natural colors. Contains over 200 old-fashioned herb medicine recipes for home use. 10c postpaid. Worth dollars! Botanicals, 145 W. 112th St., Chicago.

OLD BOOKS WANTED

WE Pay up to \$5000 each for old books, also high cash prices for old magazines, letters, newspapers. A single story book, school book, old Bible, travel book, almanac, etc., that looks worthless may bring you \$50, \$100 or \$500 in cash. Thousands wanted. Send 10c now for latest price list. American Book Mart, 140 S. Dearborn, Dept. 1913, Chicago.

BOOKS, PERIODICALS, PICTURES, POSTCARDS

NEWEST Radio, electrical books, 20c to \$1. Amazing values. Catalog free. Electronic Publishing Co., Box 323-B, Lincoln, Nebr.

FREE—Send for lists of instructive and profitable books. Herbert Seiler, 33 Klefer, Buffalo, N. Y.

RARE Antique books. Some two hundred years old. List, ten cents. Friday, Streater, Ill.

MAGAZINES Bought, sold, exchanged. Lists 10c. Seeley Service, Jennings, La.

MYSTICISM Booklet, the champion of protestantism. Gust A. Johnson, Pomona, California.

LET Our high-gloss photograph postcards sell your products. Send picture with sales wording and 50 cts. for sample. 100 \$3.00; 500—\$10.00; 1000—\$17.00. Cline Studios, Chattanooga, Tenn.

MAGAZINE Subscriptions at lowest rates! 36-page catalogue free! Paramount Agency, 140 West 42nd, New York.

BOOKS? Bought! Sold! Rented! Catalog. Bookery, 3941 Shaker Square Station, Cleveland, Ohio.

YOUR Favorite magazines—Half price. Catalog, 10c. Magazine Exchange, Baseline, San Bernardino, Calif.

GAMES—ENTERTAINMENT

PLAY Electric games for excitement and fun! Baseball, football, basketball. Particulars free. Electric Games, Holyoke, Mass.

PLAYS, Operettas, musical comedies, complete minstrel first-parts with song programs, blackface skits, vaudeville acts, monologs, dialogs, recitations, juvenile plays and songs, musical readings, entertainments, make-up goods. Catalog free. T. S. Denison & Co., 203 N. Wabash, Chicago.

CARNIVAL Games make you money. Outfits supplied, catalog 10c. "Moore-Made," LaPeer, Mich.

MAGIC TRICKS, PUZZLES, JOKER NOVELTIES

FREE Tricks! Join Magicians' Fraternity! Monthly magazine, sample 10c. International Magicians, Mt. Morris, Ill.

BE A magician. Send 20c mailing fee for our large catalog. Chicago Magic Co., 2300 N. Mason Ave., Chicago.

LARGE Illustrated magic catalogue 20c. Lynn, Midland Ave., Paramus, N. J.

MANUFACTURERS Sensational \$1 novelties, tricks, assortment—25c. Novelty Manufacturers, Rimer, Penna.

LEARN Ventriloquist art. Easy. Low cost. Free details. Apex, 221 E. 31, New York.

NOVELTIES: 12 Assorted samples, only 10c. Hoover's, 1525 Grove St., Lafayette, Ind.

BE A magician. Large professional magic catalogue of latest tricks 25c. Cash paid for complete Tarbell magic courses. Write, Ireland, 109 N. Dearborn, Chicago.

VENTRILOQUISM—Learn quickly. Particulars free. Prof. Kingsley, 1142 West Seventh Street, Erie, Penna.

CHOICE Assortment of marvelous card tricks that you can do. Including instructions that enables you to perform hundreds of tricks with any pack of cards. 50c postpaid—stamps not accepted. The Magic Mart, 1228 Eye St. N. W., Box 322, Washington, D. C.

VENTRILOQUISM—Complete \$2.50 course 25c. Lonk Institute, D-1613, Palatine, Ill.

LARGE Professional magic catalogue, 25c. Holden, 226 W. 42nd St., New York.

MAGIC Catalogue, latest tricks, 10c. Frank Lane, Little Bldg., Boston, Mass.

MAGIC Tricks at lower prices. South's largest line. My famous "Book 1000 Wonders" and "50 Magic Mysteries" postpaid 10c. Write today. You will be surprised. Lyle Douglas, Station A-5, Dallas, Tex.

EARN Money in any crowd. Call names of strangers, tell unspoken questions. Professional course mind reading, spirit writing, etc., \$1. Henderson, Box 341, San Bernardino, Calif.

LEARN Ventriloquism, 3c stamp brings particulars. Smith, 125 N. Jefferson, Peoria, Ill.

RARE COINS

SOME Specimens 1909 cent worth \$10. We buy certain coins, common and rare. Others worth to \$6000; certain 1864-1865 Indian head cents \$100 each; dimes before 1895, \$450; Liberty head nickels before 1914, \$300; large pennies \$2000; encased postage stamps, \$13; half cents, \$275; half dimes, \$175; quarters, \$300; fractional currencies; paper money; gold dollars, \$1,500; colonial coins, \$300; silver dollars, \$4,000; 1933, 50c, \$4.00; foreign coins \$165, etc. Only certain coins worth top prices, but others have premium value too. Send 15c today for illustrated 1937 coin book, before sending coins. National Coin Corp., (80), Springfield, Mass.

1803 JAVA Copper, latest bargain coin list, dime. W. Webb, Westminster Rd., Rochester, N. Y.

GENUINE \$20 Confederate bill, arrow head, five foreign coins, one each U. S. cents, large, white and Indian Civil War token. All for fifty cents. Grant's Hobby Shop, 109 Empire St., Providence, R. I.

THREE New coins and list 10c. Ray Willard, Monett, Mo.

\$5.00 TO \$2500.00 Each paid for rare coins. Send 15c for newest 36 page illustrated buying book. Bob Cohen, Box 3507-R, Cleveland, Ohio.

STATE Tax tokens, 7 different, 20c, 16 different, 50c. Wayne Ward, Moscow, Idaho.

OLD Money wanted. Will pay \$100.00 for 1804 dime, S. mint, \$50.00 for 1913 Liberty head nickel (not buffalo). Big premiums paid for all rare coins. Send 4c for large coin folder. May mean much profit to you. Numismatic Co., Dept. 20, Fort Worth, Texas.

33 COINS. Bills, tokens 25c. Otto Oddehon, 106E, Kansas City, Mo.

CALIFORNIA Quarter size gold, 25c. 20 different coins, tokens, 25c; 100, \$1.00. Bishoff, 739 Locust St., Kansas City, Mo.

1837 LARGE Cent 15c; lists free. Maurice Gould, Box 73, Brighton, Mass.

GET Profit and pleasure in collecting old coins. Send 10c for 48-page illustrated coin catalog. You'll be delighted with it. Send for it now. B. Max Mehl, 370 Mehl Bldg., Fort Worth, Texas. Largest rare coin establishment in U. S. Established 37 years.

LINCOLN Commemorative $\frac{1}{2}$ ¢, 1¢ each, five different commemoratives 5¢ postpaid. S. M. Koepfel, Merritt Building, Los Angeles, California.

\$5 TO \$500 Each paid for hundreds of old or odd coins. Keep all until posted. Many very valuable. Send 10 cents for illustrated Coin Value Book. 4x6. Guaranteed buying and selling prices. 31 years in business. Coin Exchange, Box 5, Le Roy, N. Y.

UNITED States coins at bargain prices. 2c piece and newest 1937 selling price list 10c. Em. Cohen, Box 3507, Cleveland, Ohio.

FREE! Foreign coin, banknote, and large illustrated coin catalogue. Send 4c postage. Coin approvals sent. Tatham Coinco, Springfield-125, Mass.

RARE U. S. foreign coins, war medals. Catalogue 10c. Mengelle, Colorado Springs, Colo.

UNITED States. Large cent, 2c bronze, 3c nickel and bargain list, 25c. Eleven dates large cents, \$1. George P. Coffin Co., Augusta, Maine.

COMMEMORATIVE $\frac{1}{2}$ ¢, Illinois, Oregon, Stone Mountain, San Diego, Texas, Long Island, \$1.50 each. Illustrated catalogue 10c. Norman Shultz, Salt Lake, Utah.

STAMP COLLECTING

REIMERS New packet! Kenya lion; Nyasaland leopard; British jubilee; Paraguay airmail; Morocco; Tanganyika, and many other scarce countries in our packet of new, recent issues—stamps many have never seen! Get this packet today—5c to approval applicants. Reimers, 212 Flatiron Bldg., Fort Worth, Tex.

PRODIGIOUS Gift! German state, Selangor, Perak, Trinidad, Negri Sembilan, foreign revenue, bicolorized banana airmail, Siberia. Absolutely free with approvals! Postage 3c. Saxon Co., Dept. 65, Albee Bldg., Brooklyn, N. Y.

SAMOA Kingdom set! High catalogue, plus thirty pictorials, triangle, commemoratives, airmails—10c with double premium approvals. Tru-Value, Box P1412, Hartford, Conn.

CHINA-JAPAN. Collection 50 different from dragon land, including martyrs, Dr. Sen, dragon flies. Only 10c with approvals. First 100 answers receive beautiful Queen Astrid and Baudouin stamp. Valley Stamp Co., 1876 S. Penn. St., Denver, Colo.

50 DIFFERENT Stamps cataloging over \$1 only 10c to approval applicants. 20,000 different stamps of prices ranging from 1c up. All stamps guaranteed genuine. A fine selection of U. S. revenues. F. G. Stein, Dept. 412, 7360 N. Seeley Ave., Chicago.

ROUND The world—1075 different stamps cataloging \$25, with free premium, \$1.85. Uncas Stamp Co., 43 E. Town St., Norwich, Conn.

100 DIFFERENT Nicaragua \$1. M. Mantell, 227 Collins, Miami Beach, Fla.

BUY Stamps at your own price. Auction catalogue free. South Texas, 314 Gunter Bldg., San Antonio, Tex.

AIRMAILS. Commemoratives, etc. 202—10c. Wehrli, 49 Broadway, Passaic, N. J.

TWENTY Airmails dime with approvals. Notro Stampeco, 4909 N. Seeley, Chicago.

OVER 23 Years old, no trash. 25 different countries 25c, 50 different 50c from three old collections, many very rare. Liberty Stamp Co., P. O. Box 2694, Salt Lake City, Utah.

PANAMA Lindbergh airmail 5c. Approvals. Jack Millhiser, 7724 Abbott, Pittsburgh, Penna.

150 DIFFERENT Foreign, 5c, approvals. Schell, 127 Rose, Reading, Penna.

30 GRENADA. Ecuador, Guatemala, etc., 6c to approval applicants. Schneider, Box 42, Canton, Ohio.

MONGOLIAN Set—10c with approval selection. Pomeroy Stamp Co., Richfield, Minneapolis, Minn.

TWENTY Air mail—5c with approvals. Berry's, 219 Barrett, Syracuse, N. Y.

BRITISH Colonial packet, cataloging \$2, only 20c. Approvals sent. York Co., Toronto 9, Ontario.

GIGANTIC Bhopal triangle, Turka Calicos, \$3 U. S., Cayman Islands, rare genuine Baden. Everything free to approval applicants enclosing 3c postage. Viking, 1-2 Hanson Pl., Brooklyn, N. Y.

DANISH Royal jubilee, 50c a set. Hildergrade 29, Lumbye, Copenhagen, Denmark.

PLATE Blocks in position sets of Texas, Oregon, Anthony, army, navy, Virginia Dare. Prices on request. John Latka, 5422 S. Lorel Ave., Chicago, Ill.

MINT Yorktown and ten hard stamps from Andorra, Epirus, etc., only 6c to applicants for my new approvals. Shook, 4526 Stanford, Chevy Chase, Md.

FREE—Lord's Prayer on penny. Wonderful penny approvals. St. Elmo, 2134 Sunnyside, Chicago, Ill.

300 MIXED. Many countries, 15c. Approvals, Harvey Teeple, Decatur, Ind.

NEW Gauge. Sensational! Indispensable! Over ten different philatelic uses. Send quarter. Dennis, Osgood St., Pittsburgh, Penna.

THE World in a packet—100 different stamps from 100 different countries, including Abyssinia, Afghanistan, Brunel, Falkland, Zanzibar, and others from Africa, Asia, South America, West Indies, etc. Our pamphlet which tells "How to Make a Stamp Collection Properly," together with our large bargain list of albums, packets, sets, etc., all for only 20c. Queen City Stamp Co., Room 36, 604 Race St., Cincinnati, Ohio.

15 AIRMAILS Free to approval applicants. Globetrotter, Hotel LaSalle, South Bend, Ind.

250 U. S. Commemoratives \$1. Wonder mixture, 1b. 55c. Maumee Stamp Co., Maumee, Ohio.

SWAZIELAND. Ten queer countries, 10c. Approvals. Banhagel, Box 757, Detroit, Mich.

APPROVALS—U. S. many foreign countries. Lincoln Stampeco, Shelbyville, Ill.

EARLY U. S. Send for list. M. Place, Harding, Mass.

200 DIFFERENT Stamps 10c. Approvals. Lorenz, 2450 S. Troy St., Chicago, Ill.

FREE! Coronation set. Postage 3c. Roberts, 901 P. Fourth, Baycity, Mich.

LOWEST Wholesale price. Directory and fifty different rare stamps for \$1. No approvals. Patek's, PMC893 Spuzzum, B. C., Canada.

BEST Penny approvals. Mrs. Drake, 4306 Chestnut St., Philadelphia, Penna.

CUBA! Beautiful new sugar commemorative set. Complete, unused, 10c to approval applicants. Riedell, Greensburg, Penna.

EXCELLENT Approvals. Lewis Willis, Route 7, Box 93-B, Roanoke, Va.

BETTER Grade or penny approvals, free premium. Olson, 3621-17 Ave., Minneapolis, Minn.

PHENOMENAL! Free collection! Azerbaijan, Tanganyika, Belgian Congo, etc., with approvals. Rosenberg, 3544 W-12th Pl., Chicago.

FREE—New Bolivian issue. 9 varieties complete, to approval applicants. Sets that satisfy. Charles Cleveland, 806 N. Humphrey Ave., Oak Park, Ill.

CORONATION Jubilee air, etc., 55 different 55 countries 10c, approvals. Kellen Stamp Co., 112 Bailey Ave., Pittsburgh, Penna.

NO Approvals. Our lists are much cheaper. Sent free. Fred Osborne, 1116 Park Ave., Albuquerque, N. Mex.

WORLDWIDE Penny approvals. Amazing values. L. D. Gibson, B-203, Bandana, N. Car.

LIBERAL Premiums, your choice. Stamps you actually want, from approvals. Postage and reference please. Oril, Marysville, Wash.

DIAMOND Shaped air mail—Big packet 105 all different, including air mail, commemoratives, Congo, Epirus, Manchukuo, etc.; set of two ex-King Edwards and Costa Rica diamond shaped air mail; scarce U. S. telegraph, cat. 30c; pkt. British Colonies—Gwallor, Hyderabad, Silver Jubilee; big lists. Everything for 5c to approval applicants. Send today! Mystic Stamp Co., Dept. 86, Camden, New York.

100 U. S. Before 1912, 25c. Box 775, Ponca City, Okla.

BEAUTIFUL Airmail set 3c with bargain approvals. Colter, Boles, Mo.

U. S. CONSTITUTION Series. In honor of the 150th anniversary of the U. S. Constitution, Honduras has just issued a 48c airmail stamp which is destined to become the most famous stamp in the whole world. With it, Honduras has bestowed on our country the highest honor one country can show another. Very large and beautiful, printed in six colors. Inscribed in two languages, it illustrates the U. S. flag in red, white and blue and the sun shining on our Constitution. An aristocrat among stamps deserving the place of honor in any collection. Other countries have also honored our Constitution anniversary; Nicaragua with a beautiful two-colored airmail stamp, and France with a blue postage stamp showing the flags of both countries. Later, a set will appear from Ecuador showing the U. S. flag in red, white and blue, George Washington and the American eagle. A wonderful pageant of patriotic stamps. Like jubilees and coronations, we shall have them all. Those already issued we are now sending "on approval." In our current "monthly bulletin" full date is given. This free "monthly bulletin" always contains the latest stamp news and best bargains. We shall gladly send you a copy together with a fine approval selection upon request. Write today. Approval Headquarters, Globus Stamp Company, 268 Fourth Avenue, Dept. 50, New York City, N. Y.

U. S. Price list free. Send postage. M. G. Hanna, 335 Fifth Ave., Pittsburgh, Penna.

CHRISTMAS Gift! 150 all different U. S. postage, only one dollar. Jungkind, Box 806P, Little Rock, Ark.

DIAMOND Airpost commemorative issue complete, proletariat portraits complete, dragon stamp, with 117 additional, cataloging \$3.00, only 10c. Friendly Philatelists, Box 4428P, Philadelphia, Penna.

CORONATIONS! Eight diff., some mint, 10c with approvals. Crescent Stamps, London, Canada.

50 DIFFERENT Stamps, all countries, only 2c! Approvals. Price lists. Bob Houston, Herrin, Ill.

FREE—Coronation error which astounded British Empire, also correct variety—absolutely free—providing your purchase exceeds 25c from "double-premium" approvals. Bargain Stamps, Box 5147, Los Angeles, California.

UNBEATABLE Offer, sets of coronations, Canada, Great Britain, Tannou Touva diamonds, ex-king Edwards, silver jubilee, 10 Yugoslavia assassinated king, 4 fantastical Persian, 8 war torn Chinese, everything 10c to approval applicants. Mortimer Ellis, 2841 West 37th Street, Brooklyn, New York.

110 DIFFERENT Including U. S. commemoratives 10c. Approvals sent. Elmer's, 196a Washington St., Boston, Mass.

65 BRITISH Colonies, including jubilees, coronation, 10c with approvals. Sachse Stamps, London, Canada.

STAMP Annual free: Special coronation edition—describes and illustrates albums, supplies, U. S., British colonial, coronation and foreign stamps. This fifty-page catalogue free. Gray Stamp Company, Dept. P.M., Toronto, Canada.

300 DIFFERENT Stamps 10c with approvals. R. McKinney, Elsie, Michigan.

SPECIAL 55 Stamp, Abyssinia, Azerbaijan, etc., 6 cts. Approvals. Hutter, Cumberland, Maryland.

TRIANGLE. Map stamps, jubilees, \$2 and \$5 U. S. included in 100 different sent to serious approval applicants for 10c. Jones Stamp Co., Box 146, Norristown, Penna.

SURPRISE With approvals. Irvin Wood, 3113 Brendan Ave., Baltimore, Md.

BRITISH Guiana, 100 assorted, including pictorials, coronations, centenary commemoratives, etc. \$1.00 (bill): 12 different 35c (coin); coronation set on cover 35c. Alexander, Box 268 A, Georgetown, British Guiana.

FINLAND—25 Different, 10c; 15 China 10c. Stamps accepted. Elses, Bowling Green, Ohio.

\$1.00 PACKET Free! Enclose postage and request approvals. Secrist, Muscatine, Iowa.

ODDITIES From Haiti, Eritrea, Ethiopia, Siam, Newfoundland, Colombia, Africa, Old U. S., 22 others, 10c to approval applicants. Mark, 3245a Edgar, Maplewood, Mo.

JUBILEES—10 Different for 10c, with approvals. Rice, Girard, California.

WORLD'S Biggest map stamp. England coronation, jubilee, 51 others, 5c with approvals. Franklin Shultes, Berne, New York.

LARGE List free, offering over 100 countries. Hasselbaum, 316P Flatbush Ave., Brooklyn, N. Y.

100 **AUSTRALIA**, China, 10 cts. Fred Pinnell, 111 Close, Toronto, Canada.

STAMPS. A superb selection sent on approval. Quality at low prices. Fred Herzberg, Box 91-P, Elmhurst, Ill.

COMMEMORATIVES. 25 American, British, 15c. Approvals. George Greenlaw, Saint Petersburg, Florida.

OLD Stamps and envelopes wanted. Will pay \$200 for 1911 Vindiz stamp. Send 5c for large illustrated folder showing amazing prices paid. Vernon Baker, 444-PM-11, Elyria, Ohio.

WORLD'S Smallest airmail, free stamp magazine, \$2.00 U. S., animals, bird, train, Indian, airplane, commemoratives, special issues, scarce stamps 25 countries, 5c with approvals. Capital Stamp, Dept. 1, Little Rock, Arkansas.

U. S. APPROVALS! Bonafide collectors only! Reasonable! Box 323, Minneapolis.

FREE! Packet to approval applicants. Schramm, 1489 East 19th Street, Brooklyn, N. Y.

JAMAICA Coronation, elephant triangle, Touva diamond, U. S. \$1, \$2, \$4, \$5. Ceylon pictorial, India jubilee, Kiwi, fantail, madonna, aviator, 5c with approvals. Plymouth, A23, Bell, California.

SCARCE Argentine 20 pesos, No. 356 (perf init)—found in very few collections. Beautiful mint Cayman Islands; 10c Hong-Kong and 50 different stamps including U. S. commemoratives, new airmail, Cape Verde, Soudan, Honduras, Newfoundland, Hyderabad, Brazil, Canada, Gold-Coast, \$2 U. S. All for only 5c to approval applicants. Lenott Stamp Company, Dept. 9, Claiborne, Maryland.

(FIRST) Stamps Argentine and 9 other countries 10c. Approvals. Zegel Stampeco, Windham, N. Y.

EARN Cash—Sell approvals. Complete outfit, approval book, hinges, valuable stamps, sent for 50c. Large profit, satisfaction guaranteed. Ellison, 2841 West 37th Street, Brooklyn, New York.

SURPRISE Packet free to approval applicants. First rate approvals. Alfred C. Johns, Sidney, Montana.

FREE! Scarce triangle airmail! Coronation! Pictorials! British colonies! Wonderful packet 106 different (no Europe) 5c to approval applicants. Bargain Co., Box 39P, Times Square Station, New York.

100 **DIFFERENT** Scandinavian 10c with approvals. Lloyd Rockefeller, Red Hook, N. Y.

APPROVAL Books by countries. Raymond Holland, Sterling Bldg., Houston, Texas.

75 **OLD** U. S. revenues 25c. 60 Peru 25c. Associated Stamps, 1540 St. Mary, New Orleans, La.

UNPICKED! 100 U. S. revenues on documents—10c, 1,000—60c. Vanvoorhis, Hyndman, Pennsylvania.

DANZIG, Germany, Austria approvals. Zimmer, 722 Culver Road, Rochester, N. Y.

CANADIAN Royal William and packet intriguing stamps from thirty-five countries, 10c approval applicants. M. T. Watson, Menomonie, Wis.

RARE Airmail, scarce camel stamps. Chance to join big stamp club. Mammoth stamp packet. All for only 5c. Approvals. Atlas Stamps, Little Rock, Arkansas.

44 **DIFFERENT** U. S. including \$5 stamp, or complete set U. S. bicentennials, or 30 different obsolete Canada, 13c postpaid with approvals. C. A. Lennan Co., Box 322, Church Street Annex, New York, N. Y.

U. S. Commemoratives, coronations, jubilees, British Colonies, Boration lot, 5c with approvals. Hudson Co., 116 Nassau, New York City.

CORONATION Packet of Malta, Bahamas, Cayman Is., Turks Is., and England. These stamps are the best and most popular this year and will prove to be immensely valuable. Only 3c to serious approval applicants. Potomac Stamp Co., Dept. 112-A, Washington, D. C.

11 **CORONATIONS** 25c. Including scarce Southern Rhodesia with approval requests, also receive free \$2 collection from 52 countries. Poppenger, South High, Akron, Ohio.

ONE, Two cent approvals. Lobdell, 625 South 18th, Salem, Oregon.

25 **DIFFERENT** Persia 20c. Ace penny approvals. Bent, 1739 N. Wells, Chicago.

FREE! 50 Diff. commems. with 6 months subscription 25c. Marconi's Stamp News, Box 35, Brooklyn.

STAMP Outfit free! Scarce Tannou Touva triangle, hard-to-get Cayman Islands (map), new coronations from Canada and Great Britain, world's largest ship stamp, Sudan (desert scene), thrilling stamps from Asia, Africa and other far-off lands are all included in our famous "Round-the-World" packet, also illustrated lists and a watermark detector—this big outfit absolutely free to approval applicants sending 3c for postage! Write for this sensational offer today! Midwood Stamp Company, Department 4P, Midwood Station, Brooklyn, New York.

ABYSSINIA No. 131, Value \$1. Only 25c to approval applicants. Clarke, Manitou, Colorado.

THE Gold and silver coronation set of Persia is one of the most beautiful issues of stamps in the world. Printed in actual gold and silver, the stamps show the glories of mystic Persia. We'll send the complete set of 17 varieties, all unused, at the special price of only 25c to approval applicants. The first hundred to answer this ad will be sent their stamps in a cover bearing the new S. P. A. 10c Smoky Mountain souvenir sheet without any extra charge! Rush your order for the most outstanding offer of 1937! Prasek Company, Dept. 55, White Plains, New York.

U. S. Stamps. Complete photographs and descriptions of U. S. stamps 1847-1936. New book just issued by government 25c postpaid. 15 different U. S. stamps included to approval applicants. R. Roberts, 5932 Newburg, Chicago.

1000 **DANDY** Mixed stamps 25c. Monjar, 1542 Waverly, Cincinnati, Ohio.

41 **DIFFERENT** U. S. including \$1.00 Franklin, 10c. Brooks, 2502C Kenmore Place, Brooklyn, N. Y.

PACKET Bargains (non-duplicating): 10 Africa 2c; 15 China 3c; 25 Japan 3c; 1000 foreign 89c. Wright Company, 2527 Guilford, Baltimore, Md.

SAVE Money! Buy at your own price! Auction catalogue free. Rlordan's, Linwood Station, Detroit, Michigan.

FREE—Big wholesale stamp catalogue, postage 3c. Stamp Importers, Palms Station, Los Angeles, Calif.

50 **MINT** Pictorials 10c with approvals. McAdam, Alexandria, South Dakota.

U. S. Packets: 50, 10c; 100, 30c; 150, \$1.00; 250 foreign or 30 Canada, 10c. Stamp House, Wenatchee, Washington.

FREE—20 Different Canada to approval applicants. Fort Dearborn, 5439 Aberdeen, Chicago.

OVER \$2.00 Catalog value including coronation, Edwards, jubilees, 5c with approvals. Approval Co., 2846 Harrison Street, San Francisco, Calif.

175 U. S. Commemoratives, etc., 10c.; 500—25c. Box 457, Newark, N. J.

FREE—Scarce triangle with over 100 different, coronation, jubilee, Edward, 5c. Frontier Stamp Co., 2058 E. 24 St., Brooklyn.

OPPORTUNITY—Over 100 different, triangle, diamond, 10c. Souvenir, Foley, Box 5, Sheephead Bay, Brooklyn.

BUILD Collections new way. Year's membership, 111 different rare stamps 25c. Pacific Exchange, 348 Olympic Place, Seattle.

TRIANGLES—Nine different triangle stamps only 10c with approvals. Seaman, Box 595, Lancaster, Penna.

STAMP Dealers, your ad here will bring wonderful returns. Ask me for proof. F. W. Johnson, Manager, Classified Advertising, Popular Mechanics Magazine, 200 E. Ontario St., Chicago.

FREE—30 British Colonies, pictorials, coronations, to approval applicants. Ellis, Box 86, Orono, Maine.

50 U. S. Used different commemoratives for 30c (stamps). Steger, Box 154, Crown Point, Ind.

DISGUSTED? Try my approvals. 1c up. Bargains galore. Viscusi, 4, Scotia, N. Y.

FREE. U. S. \$1, \$2, \$4 and \$5 stamps. Unbeatable U. S. approvals. Nelson, 78 E. 5th St., St. Paul, Minn.

OBSOLETE! Scarce \$1 Abyssinia elephant and thirty other rare stamps totaling \$1.25, sent approval applicants for 3c. Kurler, King, Lancaster, Ohio.

SETS Yugoslavia, Netherlands, Africa, 5c. Approvals. Rock, 378 Avon Ave., Newark, N. J.

CORONATIONS! Jubilees, airmails, Edwards, fine lot, 5c with approvals. Lew Ward & Sons, 116 Nassau, New York City.

PERU 50 Different 40c; 25 different South America only 5c to approval applicants. Don't send coins. N. Ralston, P. O. Box 2573, Havana, Cuba.

U. S. Approvals only. Send post card for selection of U. S. stamps on approval: 19th century, commemoratives, air mails, revenues. John C. Daub, Dept. E, Wabash Bldg., Pittsburgh, Penna.

FREE Set to approval applicants for 3c postage. August Fischer, 235 Citizens Bldg., Louisville, Ky.

CANNON! Set of stamps showing cannon, firing squad, cavalry charge and 200 other different stamps, only 10c to approval applicants. L. H. Reich Stamp Co., 4225 Broadway, Chicago.

40 U. S. Commemoratives, airs, etc., 10c with approvals. The Stamp Shop, 809 Holland Bldg., St. Louis, Mo.

NEW Rivera nude stamp! World's largest triangle! Congo, Sudan, South Seas, bicolours, pictorials, and many others. Only 3c with approvals. Cactus Junior Approvals, Box 1870, Tucson, Ariz.

50 **GOOD** Stamps 3c, approvals. Ransom, 1333 Pontiac, Ann Arbor, Mich.

GIANT-SIZED Russian Zeppelin stamp, cat. val. 20c! and beautiful Lithuania airmail triangle; also big packet of 53 diff. stamps including Azerbaijan, Ephrus, new Martinique, etc., and illustrated lists, all for 5c to approval applicants! World-Wide Stamp Co., Box 600, Camden, New York.

FREE—The Stamp Finder! Our new 24 page edition, fully illustrated, which will enable you to instantly identify all difficult stamps. Also fine packet of odd and unusual stamps from Bosnia-Herzegovina, Monaco, Patiala, Eritrea, etc., including maps, ships, animals and strange scenes. All free to approval applicants inclosing 3c postage. Garcelon Stamp Co., Box 900, Calais, Maine.

DIAMOND-SHAPED Stamp, Liberia gunboat triangle, two other triangles, silver jubilee, 27 others, 5c. Crowder Co., 127E North, Baltimore, Md.

FREE! 107 Different, 30 countries. Extra 25 U. S. including \$1 value, with approvals. Send 6c for packing, mailing. Ace Stamp, Colonial Arcade, Cleveland, Ohio.

FREE—\$2 And 15 other U. S. Foreign approvals. Postage 3c. Wm. Clatworthy, Upland, Calif.

LIBERIA Triangles free to approval applicants. Stephen Link, Box 397, Union, N. J.

ATTENTION—World's largest diamond shaped airmail, new rare King Edward set, Canadian Niagara Falls, Cartier and others. All 10c provided you desire our approvals. Pair-Play Stamp Service, 1215 Browning Blvd., Los Angeles, Calif.

300 **DIFFERENT** 20c; 1,000, \$1; 2,000, \$3; 3,000, \$7; 5,000, \$17. Fred Onken, 630 79th St., Brooklyn.

FREE! "United States, British Colonies and Better-Grade Foreign Stamps"—our valuable illustrated 96-page catalog. Money-saving prices! Send today. H. E. Harris & Co., 137 Transit Bldg., Boston, Mass.

PENNY Approvals that please. Haywood, 395 Adams St., Pomona, Calif.

50 **DIFFERENT** British Empire including jubilee, Edwards, 50 different new, recent and pictorial world issues, 15 different airmails, 500 hinges, perforation gauge, all for 25c. Approvals sent. Lists free. Victoria Stamp Co., London, 4, Canada.

BRAZIL, 50 Different 10c with bargain approvals. Davis, Silver Lake, Ind.

ASK For our wonderful one cent approvals. Prospect Stamp Co., 225 Broadway, Toronto, Canada.

WHOLESALE Catalog for dealers. Illustrated. Postage 5c. Frank Co., 4900 Chalmers, Baltimore, Md.

\$5 U. S. Red and blue liberty, present postage value, Scott No. 573 cat. \$1.25 (retails as high as \$1 net by some dealers) only 5c to approval applicants. Giant U. S. price list free! Tatham Stamp Co., Springfield-5, Mass.

PENNY Approvals, that satisfy. Nell Gronberg, Box 5441-P, Philadelphia, Penna.

WEEKLY Stamp magazine, thirteen weeks, 10c. Stamp Journal, Kalamazoo, Mich.

U. S.—45 Different 10c. Free 25 different with approvals. Enclose 3c. Seidenberg, Baroda, Mich.

30 DIFFERENT Angola, Cape Verde, Guinea, Portugal, Mozambique, St. Thomas and Prince 5c. Approvals. Depraw, Ocean Park, Calif.

FREE, 50 Stamps, Manchukuo, etc. Postage 1c. Album 3c. U. S. bargains. Bulard, 268 Northampton, Boston, Mass.

ILLUSTRATED U. S. list, price 50c, large complete U. S. price list free. Send postage. Stanley Gibbons, 38P Park Row, New York.

NEWFOUNDLAND, 15 Different 5c with approvals. Frederick Brown, Plainfield, N. J.

FREE, Dollar packet to approval applicants. Harlan, 5301 S. Marshfield, Chicago.

QUEEREST Stamp packet. Receive world's smallest stamp; Vatican City; scarce Liberia triangle; 1935 Greek Red Cross picturing coiled snake in Garden of Eden; Australian Bushman; new Spanish Morocco; Japan 'quake stamp; Manchukuo; many others. Only 5c to approval applicants. R. M. Stamp Co., P. O. Box 230P, Port Chester, N. Y.

APPROVAL Sheets. One to three cents. Frederick B. Driver, 2009 Finance Bldg., Philadelphia, Penna.

4½ TRIANGLES! Guatemala bisect (diagonal half-stamp), beautiful Liberia, three additional triangles, 27 other stamps. 5c. Abell Co., 1812 St. Paul, Baltimore, Md.

25 UNITED States, including \$4 and \$5 stamps free to approval applicants. 3c postage. Brownie Stamp Shop, Flint, Mich.

HOBBIES AND COLLECTIONS

ALBUMS For match book covers. Hold 240. No paste. Postpaid 65c. Matchless Album, G. C. P. O. Box 120, New York.

KNITMASTER Machine makes knitted articles quickly. Postpaid east \$1.98. Send stamp for literature. Ainslie Co., 738 Grand St., Brooklyn, N. Y.

PHOTO FINISHING

PHOTOGRAPHIC Greeting cards, beautiful, distinctive. Send negative with 10c for sample. Goff Studios, 4472 Broadway, Chicago.

20 REPRINTS 25c. Films developed, 16 prints 25c. Enlargements 8x10, 25c; 5x7, 10c. Low Photo, M-2857 Neva, Chicago.

OIL Painting from photograph. \$5. Portraiture, 826 Noble, Chicago.

MAIL Your rolls to film center of the world. Any size roll developed and printed 25c coin. DeLuxe enlargement coupon free! Photo Finishing Shop, Est. 23 yrs., 411-P Genesee Valley Trust Bldg., Rochester, N. Y. "The Camera City."

IMMEDIATE Service! Better pictures. Two beautiful heavy-weight professional enlargements and eight guaranteed Perfection prints 25c coin. Sixteen pictures from roll 25c. Eight beautiful enlargements from roll only 25c. Candid rolls developed free—prints enlarged to 3x4, only 4c each. Pictures sent back same day film is received. American Studios, Box B, LaCrosse, Wis.

ROLLS Developed with 20 prints 25c. Extra reprints 20 for 25c. Skrudland, 6444-8 Diversey, Chicago.

FILMS Developed 2 prints of each 25c; 20 reprints 25c. Pine Photo, M-6134 Nevada, Chicago.

HIGHEST Class photo finishing in America. Any size roll developed and printed and two enlargements 25c. One dozen reprints and two enlargements 36c. Helen Art Photo Service, Albany, New York.

TWO Enlargements or one colored with each film developed, 25c. LaCrosse Film Company, LaCrosse, Wis.

ANY Photo reproduced on post card 15c. Negatives (films) enlarged 5x7, 10c; 3 for 25c. Paris Photo Service, 121-P West 42nd, New York City.

QUICK Service—rolls developed, 8 guaranteed prints, 2 enlargements, 25c, coin. OK Photo Service, Ottawa, Kansas.

BEAUTIFUL Photographic Christmas cards, 75c dozen. Send negative for sample, 10c. Hench Studios, 1814 Chestnut, Harrisburg, Penna.

TWO Prints each with every roll developed, 25c. Very finest quality. Reprints 2c each. Brown Photo Company, 2209-34 Lowry, Minneapolis, Minnesota.

ATTRACTIVE 11x14" Enlargements 70c. Hand colored 25c additional (C.O.D.) Send print or film. Williams, E-748 Newall, Flint, Michigan.

PROFESSIONAL Quality service. Rolls developed, 8 prints and 2 enlargements 25c. Christmas cards from your negative 5c each, including envelope. The Film Capital Service, Box 504, Rochester, N. Y.

REPRINTS 1c Each. Roll finished 15c. Henke Studio, Armstrong, Iowa.

COPIES 1¼. By 1¼ inches from any photograph—white margins—original returned unharmed. Send \$1 for 50. Additional one cent each. Hollycopy, 1544 N. Van Ness, Hollywood, Calif.

TWELVE Enlargements pen sketched for \$2.00. Send photo. Photo-Sketch, Black River Falls, Wis.

AMERICA'S Lowest prices. Guaranteed quality. Rolls developed, 2 sets Fadeproof prints, 2 big 5x7 enlargements—25c. 22 reprints 25c; 108—\$1. Photographic Christmas cards (envelopes included): 12—60c, 21—\$1.45—\$2. Enlargements (send films) —4 5x7 25c; 17—\$1. Four 8x10 50c; 9—\$1. Giant 11x14 enlargements 69c. Prompt service. Truefoto Studios, 408-4, Des Moines, Iowa.

GUARANTEED. Roll developed, 16 prints 25c. 20 reprints 25c. Introductory offer. Quality Photo, Hutchinson, Kansas.

CANDID Camera rolls expertly developed, projection printed. 50c roll trial offer. Art. Flores, Sinton, Texas.

FREE—4 Enlargements every roll 25c. 20 reprints 25c; 100—\$1.00. Filmco, Albany, Wis.

BEAUTIFUL Christmas cards with envelopes from your own negative 60c dozen. Trial order 4 for 25c. Rolls developed, printed 25c. Reprints 3c. Jones Studios, Davenport, Iowa. "Where the West begins."

BEAUTIFUL Photographic Christmas cards and calendars. Envelopes to match. Business and personal use. Sample card 10c. Calendars 15c. Send negative or write for details. Ideal Photo, Box 2255, Paterson, N. J.

PHOTOGRAPHIC Christmas cards. Exclusively individual. Send kodak negative and five cents for sample. Ten for 49c. Envelopes included. Rolls carefully developed, printed and choice of two 5x7 professional enlargements or six reprints, 25c. Reprints 3c each. Immediate service, no delay! The Photo Mill, Box 629-Z, Minneapolis, Minn.

LATEST In photo finishing. Miniature films developed, printed 3x4—4c each. Two enlargements free each roll. Radio Film, LaCrosse, Wis.

ROLL Film developed and printed, including two beautiful double weight olive tone enlargements free. 25c coin. Nu-Art Photo Shop, LaCrosse, Wis.

ENLARGEMENTS 4x6. Five for 25c. 5x7 three for 25c. 8x10 three for 35c. Hand colored and framed each 4x6, 30c. 5x7, 35c. 8x10, 45c. Send film negatives. Enlargers, Maywood, Ill.

NEW Beautiful "dated border prints" of Aristo quality. Roll developed, eight prints, free album, enlargement coupon, 25c. Aristo Photos, Dept. P, Box 5037, Chicago.

DELUXE Framed and off-colored enlargement with each roll developed. All for 25c (coin). Badger Film Service, LaCrosse, Wis.

LARJARGRAPH Reprints, five (5x7 enlargements) 29c. Cardinal Photoers, Summit, N. J.

FINER Photos guaranteed. Rolls developed professionally. 8 Velox prints, 2 bro-mide enlargements, 25c coin. Finerfotos, Box D-898, Minneapolis, Minn.

ROLLS Developed, 2 prints each and 3 free enlargement coupons, 25c; reprints, 2c each; 100 or more, 1c. Summer's Studio, Unionville, Mo.

21 REPRINTS 25c. Rolls developed, 2 prints each negative, 25c. Fred Weick, 2840 Zenobia, Denver, Colo.

ROLL Developed, 8 brilliant fadeproof Velox prints and two professional enlargements 25c. Overnight service, Young Photo Service, 405-C, Albany, N. Y.

20 REPRINTS 25c. 100 Reprints \$1. Roll developed with 16 prints 25c. Nordskog, 4, Maywood, Ill.

PROMPT Service—Quality work. Two beautiful double weight gloss enlargements, eight guaranteed neverfade prints each roll, 25c. Excel Photo Service, Dubuque, Iowa.

ROLL Developed and 5 beautiful Velox glossy prints 25c coin or stamps. Reprints 3c each. Fotoprint Service, Box E, Roanoke, Va.

ROLL Developed, 2 prints each negative, 25c. Reprints 2c. Photoshop, Ogden, Utah.

QUICKER Service, sparkling double-clear never-fade prints. Roll developed, two prints each negative, enlargement coupon 25c. Willard's, Box 3535-A, Cleveland Heights, Ohio.

ROLLS Developed. Two beautiful double-weight professional enlargements and 8 guaranteed Never Fade Perfect Tone prints. 25c coin. Rays Photo Service, LaCrosse, Wis.

FINER Finishing. Rolls developed and printed, with one colored enlargement, or two professional enlargements. All for 25c (coin). Genuine, nationally known, Moentone superior quality. Moon Photo Service, LaCrosse, Wis.

ROLL Developed 16 guaranteed prints, 25c. Smart Photo, Winona, Minn.

ROLLS Developed—Two new Beautitone Dubiwater professional enlargements, 8 guaranteed fadeless Beautitone prints, 25c. Giant Snapshots, Inc., 667A, Green Bay, Wis.

ROLL Developed and 8 guaranteed prints including two enlargements, 25c coin. Super Snapshot, Winona, Minn.

TWENTY Reprints 25c. Roll developed and two prints each negative, 25c. Star Photos, 189 N. Clark, Chicago.

BEAUTIFUL 5x7 Enlargements from your favorite negatives 17c each; three for 50c. Eight exposure roll developed and printed 25c. Work guaranteed. Jeems Service, Box 137, Ann Arbor, Mich.

FOR The discriminating amateur, roll developed and carefully printed 25c, reprints 3c. Superior workmanship, same day service. Paramount Co., 327 E. 92nd St., New York.

TWO Glossy enlargements, 1 colored with roll 25c. Arbor Service, 10, Joliet, Ill.

GET The best. Roll developed, beautiful hand colored enlargement, 8 neverfade border prints, 25c coin. Prompt service. Sun Photo Service, Drawer T, St. Paul, Minn.

COMPARE The difference! Roll developed, two professional double weight enlargements, 8 guaranteed prints, 25c coin. Excellent service. Nationwide Photo Service, Box 3333, St. Paul, Minn.

BE Modern! Get Modern service. Modern quality. Modern prices. Our modern methods give quick service and bright guaranteed neverfade pictures. Roll developed 16 prints, 25c coin. 16 reprints, 25c. Enlargement coupon. Send next roll or reprint order to Modern Finishers, 3537-C, St. Paul, Minn.

CAMERAS, PHOTO SUPPLIES

BASS—Camera crossroads of the world has ready for you a new 48 page Still Camera Bargaingram and that's news because Bass values are proverbial. Just think, a half No. 120 reinforced bakelite DeFranne roll film camera with F:2.9 Anastigmat lens in Compur shutter at \$27.75. A 9x12 cm. DeFranne Norfolk double extension plate and film pack camera, with F:6.3 lens in shutter, with film adapter and holder, new at \$16.75. Midget Marvel candid camera with F:4.5 lens at \$19.50. Dollina II coupled range finder 35 mm. candid camera with Radionar F:2.9 lens, Compur rapid shutter at \$49.75. Voigtlander Brilliant Reflex with F:7.7 lens at only \$7.50. Your money back at all times if any apparatus is not satisfactory. It is our policy for almost thirty years. Write for this latest Bass Bargaingram No. 233 and know what value and service really means. Bass Camera Co., Dept. AG, 179 W. Madison St., Chicago, Ill.

BEST Developing, printing, enlarging views and post cards of Mexico. German cameras, field glasses, movie cameras and projectors. Ask for prices and catalogues. Foto Manuel Sucr. Rudolf Rudiger, Postbox 1459, Mexico, D. F. - 105. Branch I: Av. Juarez No. 66, Branch III: Tijuana, Baja California, First St., No. 169-½.

CAMERAS And supplies. Free illustrated catalog listing everything photographic—still and movie cameras, films, lenses—at tremendous savings. Hundreds of bargains, new and used. All guaranteed. We take your old camera or equipment in trade. Write now for your free copy of our newest money-saving bargain book—just out! Limited edition. Hurry! Central Camera Co., (Photographic Headquarters since 1899), 230 S. Wabash, Dept. 12-K, Chicago.

BIG Value! \$2.65 complete darkroom outfit for only \$1.95. Everything you need for developing and making prints up to 2 1/4" x 4 1/4". Complete outfit for 3 1/4" x 5 1/4" pictures, \$4.95—a \$6.65 value! Don't wait, send order now. Marks & Fuller, Inc., Dept. PM-15, Rochester, N. Y., U. S. A.

MAKE Money in photography. Learn quickly at home. Spare or full time. Easy plan. Previous experience unnecessary. Common school education sufficient. Write for full information and requirements. American School of Photography, 3601 Michigan Ave., Dept. 3431, Chicago.

ARGUS Everready case, genuine leather, with shoulder strap, \$1.79. Mirotex, 6241 Southwood, St. Louis, Mo.

PERFECTLY Titled negatives assured. Amazingly simple formula—instructions, 3c. Greenhalgh, Box 1432, Indianapolis, Ind.

VALUABLE Information, press card 25c (coin.) Associated Service, Olney, Illinois.

NEW: Kalart synchronized range finder for popular 9x12 cm. cameras with 13.5 cm. lens. Gives your camera—new or used—candid camera convenience and sharp focus with "man-size" negatives. Speed Graphic model acclaimed by owners. Improves quality of enlargements. Made in U.S.A. See dealer or write, Kalart, Room 501, 58 Warren St., New York, N. Y.

EVEREADY Cases. World's finest rich cowhide, duo 620, Retina, Vollenda, Foth, Argus \$4.50 postpaid. Guaranteed. Quentin Products, West Salem, Illinois.

ENLARGERS, \$8.75 to \$44.50. Circular for stamp, Harold Francke, 1926 East Fernwood, Milwaukee, Wis.

MAKE Photography a profitable hobby. The Photographic Digest tells how. Send 10c for sample to 1666 Linden St., Brooklyn, N. Y.

ATTENTION: Camera fans. Earn money. Snap news events. Become our correspondent. New press cards and auto press signs issued. Registration fee \$1.00. Press-Photo Syndicate, 1658 Broadway, New York City.

PHOTOGRAPHIC Chemicals, developers. Catalog 10c. McBee Chemical Company, 1624-H Boren, Seattle.

XMAS Bargains cameras, projectors. Block, 154 East 47th, New York.

12 KODAK Snapshots transatlantic steamships \$1.00. Forman, 882 Lorimer, Brooklyn.

PHOTO Enlarger, Automatic, \$5.94. Free circular. Ideal-N, 122 E. 25th St., New York.

INCOME From your camera instead of expense. Low cost home course teaches you to make photographs for magazines, newspapers, advertisers. Tremendous demand. Earn good money wherever you live. Free book. Universal Photographers, Dept. 104, 10 W. 33rd St., New York.

HAVE You a camera? Send ten cents for recent number of our big magazine, showing how to make better pictures and earn money. American Photography, 116 Camera House, Boston, 17, Mass.

WE Purchase and accept in trade used photographic equipment. Send for bargain list. Fotoshop, 134R W. 32nd, New York City.

35% DISCOUNT On films. Write Paramount Photo Division, 327 E. 92nd St., New York.

GET Inside! Fire lines; parade lanes; courts. Photographer's Press Card (like reporters) 25c each. Emery Service, 118 Lincoln St., Pittsfield, Mass.

MOTION PICTURES AND SOUND EQUIPMENT

CENTRAL'S Free, new, money-saving bargain book explains latest movie developments, offers money-saving bargains in cameras, lenses, projectors, films. Used equipment taken in trade. Write for free copy. Central Camera Co., (Photographic Headquarters since 1899), 230 S. Wabash, Dept. 212-K, Chicago.

35MM. FILMS. Silent, sound equipment. Catalog 3c. Enterprises, 828 Chestnut, Hagerstown, Md.

16MM. TITLES—Ten words, 20c each. "The End" 10c complete. Photoart, 11 Winchester St., Boston, Mass.

WESTERNS, Comedies, 500 feet 75c. Jersey Films, 2075 Richland, Lakewood, Ohio.

16MM. AGFA Or Dupont \$2.75—100 ft. including processing. Cope Studios, 3720 South Figueroa, Los Angeles, California.

BASS Invites you to drop in when you are in Chicago and see for yourself the largest stock of cine equipment in America, silent or sound. On sale a lot of brand new RCA Victor Model PG 71 16 mm. sound on film projectors, 750 watt bulb, 10 watt amplifier, a \$500 value at \$225. RCA 16 mm. sound on film camera, newsreel model, \$250. New Keystone 8 mm., 200 watt, motor drive projector, special at \$29.25. Moviematic still or movie camera, 18 mm., \$3.75. 8 mm. Kodascope projector, motor driven, 100 watt bulb, \$16.50. Bass Cine Bargaingram No. 230 is yours for the asking. Settles your movie problems—8 mm., 16 mm., 35 mm. sound or silent. Write to Camera Crossroads of the World, Bass Camera Co., Dept. A, 179 W. Madison St., Chicago, Ill.

FILM, 8mm., 50 Feet, \$1.57. 16mm., 100 feet, \$1.99, postpaid. Goodwill Company, Jackson, Tennessee.

35MM. FILMS. Bought-sold. Lists, 6c. Paul Oakley, Nelsonville, Ohio.

8MM. FILMS, 50 Ft. \$1.35. Spring Films, Westboro, Mass.

16MM. FILMS For sale, rental and exchange. American Legion parade, war in China, Hindenburg disaster, others. Free illustrated catalogue (with sample film 10c.) Garden Exchange, 317 West 50th, New York.

XMAS Bargains, 16mm-8mm. complete line. Cine, 151 Broadway, Paterson, N. J.

PRINTED TITLES (16mm. only), eight words or less, 20c each additional word, 2c. Samples and artistic "The End" (complete) 10c. Midwest, 1024 Quincy, Topeka, Kansas.

35MM. TALKIES, Shorts 75c, features \$7.50. Sherman, 6101 Orchard Grove, Cleveland, Ohio.

8-16MM. TITLES, 2c Word. Catalogue, Cineshop, 1812 Piedmont, Charleston, West Virginia.

TALKIE Pictures rented, sold. Projectors, Simpson, 1275 So. Broadway, Dayton, Ohio.

FREE List and sample, 16mm., 8mm. film. Goodwill Company, Jackson, Tennessee.

TALKIE Projectors, 16mm., Victor Universal demonstrators. Bargains. Michigan Film Library, Brightmoor, Detroit.

NEW 8mm.-16mm. Seeman Splicer—dry scraper type, \$2.95. Photograph your own titles with a Univex or Bell & Howell 8 titler \$3.75. Positive titling film 25 ft. single 8, 35c. Double 8, 60c. New film catalogs free. Hollywood Cine Film, Dept. P11, 1431033 N. Highland, Hollywood, Calif.

SILVER Jubilee bargains! 36x48 beaded roll screen \$3.88; silent 16mm. 400 ft. films, comedies, religious, travel, features, \$6.50; reel, sound \$12.50; largest variety actually stocked; Bell & Howell continuous projector, attachment, with case, \$12.50; American Legion parade 1937, 16mm., 100 ft. \$3.35, 360 ft. \$8.45, 350 ft. sound \$16.49. 8mm. 50 ft. \$1.69, 180 ft. \$5.35. Latest China war, same prices. Victor model 10 projector with case \$69.50; complete line 9 1/2 mm. films, equipment, parts, repairs, 16mm. automatic movie camera \$3.95; 100 ft. 16mm. complete subjects, new \$1.39; Argus candid camera \$4.5, \$12.50; Keystone 16mm. camera, like new, \$9.85; 16mm. Victor sound film complete with amplifier, \$197.00; 35mm. DeVry portable soundfilm complete with amplifier, \$189.50. 5000 complete assorted 35mm. 1000 ft. films, \$1.00 reel; 8mm. Univex camera like new, \$8.45; 8mm. Univex projector, like new, \$12.95; 16mm. silent, sound rental library. Bargain, rental catalogs free. trades accepted, bought. Mogul's, 1944-J Boston Road, New York City.

BARGAINS: 8mm., 16mm. Free literature. Elder, Dept. B-42, Chelsea, Mass.

RENTAL Library—16mm., 8mm., sound-on-film. Clearance sale—comedies, cartoons. All lengths. Write for free catalogs. National Cinema Service, 3 W. 29th St., New York.

35MM. SHORTS, Silent. Cheap. Stamp. H. F. Wilson, 18 Whittier Pl., Newark, N. J.

8-16MM. FILMS, Catalogues 3c. L. Arnett, 445 Weber, Piqua, Ohio.

"THE World's Greatest Passion Play" 16mm. Seven reels. Sound with dialogue or silent. Superior than Oberammergau play. Write Hemenway Film Co., 37 Church St., Boston, Mass.

ATTRACTIVE List of films for the "individual," 8 and 16mm. Free catalogues. Abbe Films, 3 West 29th St., New York.

FREE! Bargain lists 35mm silents. Calderara, 5119 South St. Louis, Chicago.

WORLD'S Best passion play, seven reels, new version all talking sound and silent 16 and 35 mm. rent or sale. All-Sacred Film Co., 50 Melrose Street, Boston, Mass.

COLOR Popular star movies for 16mm. projectors, 100 ft. \$2.50. Sample roll 50c. Free 16mm., 8mm. bargain lists. Home Movies, Box 216, Easton, Penna.

35MM. SOUND Silent films, projectors. Savarese, Woodcliff Lake, N. J.

MOTION Pictures and accessories, free list. Daniel Bird & Sons, 196 E. 4th St., Clifton, N. J.

35MM FILMS Rented, 50c weekly. Lists 3c. Hoffman Film Service, 57 Broad, Albany, N. Y.

FREE—Send 25c for three art end titles, 16mm or 8mm, film lists and sample copy 32 page Home Movie Magazine and how to obtain free subscription. Pacific Cine Films, 1454-A N. Gardner, Hollywood, Calif.

15% TO 25% Discount on still or movie cameras. Free circular. Paramount Co., 327 E. 92nd St., New York City.

RADIOS, SUPPLIES, INSTRUCTION

35 RADIO Lessons 40c. Amateur Electrician 10c. Colonial Co., Billerica St., Chelmsford, Mass.

PHILCOS, Zeniths, all other makes. Agents cut prices. Radioman, Lake, New York.

PLANS 18 Distance record crystal sets, with "Radiobuilder"—25c. Laboratories, 151-C Liberty, San Francisco.

PARTS And kits of parts for Popular Mechanics Improved Little Giant, R235, 6 Tube, R233, Preamplifier R238, Pup R240, and Knockabout R244. Only specified parts used. Lund Manufacturing Company, 43 E. Ohio St., Chicago.

QUALITY Radios at wholesale prices. Catalog free. Capitol Radio Company, 43 E. Ohio St., Chicago.

RADIO Engineering, broadcasting, aviation and police radio, servicing, marine and Morse telegraphy taught thoroughly. All expenses low. Catalog free. Dodge's Institute, Ames St., Valparaiso, Ind.

MUSIC AND MUSICAL INSTRUMENTS

PIANISTS: Free booklet describes method improving your technique, accuracy, sight reading, memorizing. Write Dept. 422-L Broadwell Studios, Bendix Bldg., Los Angeles.

REBUILT Band and orchestra instruments. Honestly rebuilt, fully guaranteed. Catalog on request. Specify instrument interested in. Weymann Co., Dept. M-12, 1613 Chestnut St. Philadelphia.

TUNE Your own piano. Easy method. \$2. J. C. Sullivan, Grant St., Irwin, Penna.

HEAR Your song specially piano-arranged and recorded \$3; with voice \$4. Music to poems \$3. Wright Studio, 2437 N. Richards, Milwaukee, Wis.

MUSIC Composed to words. Keenan, 259 Beach St., Bridgeport, Conn.

ACCORDIONS—60% Discount. Catalog free. Metro Co., 20-A 3115 W. 13th, Chicago.

MUSIC Composed to song-poems. Orchestration arranged. Frank Wildt, Lancaster, Pennsylvania.

WE Pay cash for songs, poems or music. Earle and Arace, Station F, New York.

SONGWRITERS! Stop paying for lyrics and melodies. Correspondence and collaboration with songwriters from all parts of the country will furnish music to your lyrics, lyrics to your music—free! Send one dollar for list of collaborators and instructions. Amateur Songwriters of America, 202 Kent St., Brooklyn, N. Y.

SONG Writers. Send for publishing agreement. McKinley Music Publishers, 1501 E. 55th St., Chicago.

SONO Poets. 50-50 plan, instruction book free. Song Bureau, Salem, Indiana.

SONGWRITERS! Outstanding convincing proposition. Hibbeler, C-3, 2157 No. Avers, Chicago.

SONGWRITERS—Get "How to Write Songs" by famous Broadway composer and free rhyming dictionary. Songwriters Institute, 1234-C Broadway, New York City.

MUSIC Composed to words. Wonderful proposition. Bauer Bros., Oshkosh, Wis.

WANTED Original poems, songs, for immediate consideration. Send poems to Columbian Music Publishers, Ltd., Dept. 42, Toronto, Canada.

POEMS Wanted. Work guaranteed. We publish. Great Eastern, Thomaston, Maine.

POEM Writers, songwriters. Send for free rhyming dictionary, writers guide. Submit best poems, melodies today for bonafide, superior offer. MMM Publishers, Portland, Ore.

SELF-INSTRUCTOR Piano chord accompaniments plus music fundamentals, easy, interesting. Post paid \$1. Box 1928, Hollywood, Calif.

SONG Poems wanted to be set to music. Free examination. Send poems to McNeill, Bachelor of Music, 4153-PM S. Van Ness, Los Angeles, Calif.

DUO-FLEX Reeds for clarinets, and saxophones eliminate your reed troubles. Write for circular. Duo-Flex Reeds, 1204 1st Ave., Evansville, Ind.

ORIGINAL Music composed to your words \$5. Song printed. Reginald Belcher, Chatham, N. J. 30 years church organist.

WRITE Songs. Big money and reputation. Write for information. J. Gordon Pub. Co., 201 N. Hoyne Ave., Chicago.

SONG Poems wanted—Home, love, sacred, any subject. Send best poem today for offer. Richard Bros., 24 Woods Bldg., Chicago.

WANTED! Lyrics, melodies for songs. We arrange, publish, sell. Superior Song Studios, Passaic, N. J.

SONGS Published, arranged and composed. Royalty basis. West Coast Music Publishing Co., 942 Market St., San Francisco, Calif.

COMPOSERS-LYRICISTS. Songs arranged, words or melodies, written, revised by arranger of "Cherry Blossom Lane," "Carolina Moon," "Treasure Island," many others. Send for details. Harold Potter, 1619(P) Broadway, New York.

BUSINESS OPPORTUNITIES

FASCINATING Business. Repair, adjust typewriters, adding machines. Learn easily at home from factory expert. Earn up to \$15 daily. Complete instructions covering all makes \$3 postpaid or sent C.O.D. Adding Machine Equipment Service, 3601 Michigan, Dept. 3439, Chicago.

TOOL Salesman for garage, utility, and industrial trade. Protected territory. Permanent, profitable business opportunity. Samples furnished. Invest what you can in fast moving items. Owatonna Tool Co., Owatonna, Minn.

WORK At home, carve, paint and decorate gourds. Make radios, lamps, vases, charm strings, and hundreds other useful and ornamental articles from gourds. Book with 95 illustrations \$1. Gourd Studio, 1409 W. Holt, Pomona, Calif.

FORMULAS—Fast selling products. Guaranteed. Laboratory tested. Lowest prices. Catalog free. Kemico, 55K, Park Ridge, Ill.

SEND For free literature describing hundreds spare or full time money making plans. Thayer Co., Dept. PM, Gassaway, W. Va.

EASY Money. Moneymaking opportunities, many of them; anyone can work them, spare or full time. Details free. Lewis Co., 828-A Carpenter, Oak Park, Ill.

MONEY Making home propositions. Free particulars. Leslie, 3415 Fort Independence St., New York City.

START Profitable business at home making "Instant Solder." Does wonders. Fast seller to agents. Complete formula and advertising copy, \$1. Worth Darst, Leonard, Tex.

PUBLISH Your own magazine. Details free. Harmon's, Chester, W. Va.

I MADE Over \$50,000. Started with \$1. You have the same opportunity. I will show you how to do it for a stamp. Opportunity, B-107, East Rochester, N. Y.

VALUABLE Booklet describing 107 profitable business free. Elite Sales, 244 Arcade, Atlanta, Ga.

BUSINESS Proposition resilvering mirrors, autographs, reflectors, making chipped glass signs. Write Sprinkle, Plater, 127, Marion, Ind.

ANY Formula 25c. Paramount Service, 126 Lexington Ave., New York.

INVESTIGATE—A post card may solve your problems. California Earthworm Farms, LaCanada, Calif.

DIME Brings Our Salesman six months. Sunflower Mailers, 1202 Mathewson, Wichita, Kans.

\$50 A WEEK With a Kodak. Booklet describing 100 magazine markets 25 cents, stamp or silver. P. O. Box 663, Hastings-on-Hudson, N. Y.

MAKE Artificial marble, glazed tiles, uncanny. Tabletops, plaques, floors, hones, novelties. Hard, fireproof, inexpensive, cement secrets. Brilliant tile and liquid rubber samples 3c. John A. Payn, 945 Grande Vista Ave., Los Angeles, Calif.

GET Dollar bills in your mail daily. Nearly all profit. Particulars free. Homecraft Arts, PM, Lakeside, Calif.

HANDY Men—Earn money home operating community "Fix-It" shop. Stafford, 511 W. McClure, Peoria, Ill.

CLEANING. Oiling typewriters. Uncrowded field. Outfit \$1. Loux, 173 Washington St., Newark, N. J.

EVERYTHING Opportunity seekers. Send 10c. Everything, Richfield Station, Minneapolis, Minn.

MAKE Money with your telephone. 25c. Phone-guide, 3105 32 Ave. So., Minneapolis.

FREE Details—Start a business at home. Standard, 600 Merchant's National, Omaha, Nebraska.

HANDSOME Profits in lucrative mail order business for you. Particulars for stamp. Wells' Enterprises, Box 328-PM, Aurora, Ill.

A MAIL Offering wonderful opportunities. Stamp appreciated. Joseph Castell, 1663 Madison St., Brooklyn, N. Y.

FREE Formula. Winter soilless agriculture. Instructive, profitable. 3c stamp required. William Miller, 2501 Duncan, Louisville, Kentucky.

WHERE To buy at lowest wholesale prices. Information free. Yorena, Box P-312, Bayonne, N. J.

COLOR Concrete surface with chemical solutions. Make beautiful pottery without moulds. Garden wishing wells. Sample 10c. Hollywood Cementcraft, 8527 Wonderland, Hollywood, California.

RUBBER Mold bargains! Stamp brings catalog. Colonial Art, Derry, N. H.

\$100 STARTS "Chain" of chewing gum and confection vending machines. Steady cash income. Details free. Robbins Co., 1141P DeKalb Ave., Brooklyn, New York.

OWN Growing business. \$2.00-\$5.00 hourly profit. Clean, mothproof upholstery, carpets, clothing in homes, hotels, institutions. "Earned \$90.00 one day"—Anderson. "Working 12 hours daily"—Lookiebill. "Repeat orders building business"—Hargrave. Portable electric machines, materials, advertising furnished. Little as \$88 establishes business. Write while territories open. Home Service, Racine, Wisconsin.

MAKE Cuts from photos and drawings. Simple. Inexpensive. Both processes, \$1. Dawson Sales Co., Box 20PM, Sta. J, New York City.

\$50.00 WEEKLY! Operate mail order business for us. Product furnished. Iron-So-Ezee, Mt. Washington, Ohio.

MAKE Money direct from factory. Little Nut Vendor, Lansing, Michigan.

SELL By mail. Big profit. Write Sweeper, 101 Monmouth, Newark, N. J.

OUR Money making offers will surprise you. Investigate at once. Literature free. National Mail Despatch, Box 135A, Gillespie, Ill.

STEADY Income easy! Start home business! No canvassing! Free booklet tells how. Century, 1261-P Broadway, New York.

AFTERNOONS Free for outdoors, movies, \$340 month home. Unique plans. No canvassing. Prepare for surprise. Folio-F, Station D, Los Angeles.

DOLLARS-BY-MAIL! To win—"You must do something different"—New! Honest! Safe! 6000 word folio—"A Paying vs. a Playing Mail Business"—3c. Dr. Swearingin, Station "S," Los Angeles, California.

OPERATE Permanent, profitable social security service. Reliable party each county. Write immediately. Rimer, Box 309, Silver Springs, N. Y.

ADDED Income ideas. Mail Sales News magazine, copy 10c. Katz, 4254 No. Kimball, Chicago.

SELL Brentner mail order treatise! Particulars 3c. Green, 15798 Parkside, Detroit, Mich.

ENORMOUS Profits stamping names on key checks. We supply everything. Sample with your name-address 25c. Bohn Co., Box 85, Wilkes-Barre, Penna.

OPERATE A collection agency business from home or office. Quickly learned. Big income. Write, Cole Associates, Syracuse, N. Y.

PROFIT With new products. Make, sell, repeat. Analysis. Research. Guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, BD-1142 Sunnyside, Chicago.

INCREASE Your prestige and business. Just 1c daily for personal or 2c for business purposes, maintains permanent New York office. Co-Operative Mail Service, 126P Lexington Ave.

MAKE Money re-silvering mirrors. Formula only 15c. Boltach & Co., 5007 - 26th St., Detroit, Mich.

75 NEW Amazing money making ideas. Information free! Exchange, Box 61, East Orange, New Jersey.

NEW Marbleizing cement; makes building slabs, all sizes and shapes, for walls, ceilings, halls, etc., any place marble is used. Glossy snow-white, or colored. Can be sawed, drilled, cut to fit easily. (See samples.) They are waterproof. Dime brings surprising samples. Cowell Institute, Grayling, Michigan.

START A moth proofing business. No capital necessary. Formulas and instructions \$1. Circular free. Druley, Box 42-H, Oak Park, Ill.

WE Pay cash for your spare time! Raise giant, patented mushrooms in your basement, shed, attic. Experience unnecessary. We supply guaranteed materials and buy your crops at contract prices. We need you now. Send for free details today. United, 3848 Lincoln Ave., Dept. 65, Chicago.

MAKE And sell your own antifreeze. Big profit during winter season. Mail one dollar bill for formula and instructions. Box 1491, Casper, Wyoming.

\$20-\$100 WEEKLY Operating small business from home, no canvassing, particulars free. Elco Publishing Co., 507-A 5th Ave., New York.

STOP Job hunting! Start your own light manufacturing business. Up to 1,000% profit. Hire agents. Information free. Thermo-M Works, Peoria, Illinois.

WE Are establishing associate manufacturers. 500% profit. Something new. Troughton, Aurora, Missouri.

85 JOURNALISTIC. Advertising money-making angles. Yield big earnings. Dollar Syndicators, 3335 Diversey, Chicago.

OPPORTUNITY For man to get into something for himself—be own boss. No soliciting. Start with as little as \$75.00—a tried and proven money-maker. No previous experience required. Write H. H. Wing, Box R, Central Station, Toledo, Ohio.

CO-PARTNERS Wanted. Complete mail-order business. Box P744, Charleston, W. Va.

COMPLETE Chemical service. Newest guaranteed formulas. Research analyses. Valuable literature free. Special low prices. Miller, Chemist, 1706-L, Tampa, Fla.

"SUCCESS Beacon" anniversary edition! 72 pages! Moneymaking schemes, ideas, plans. 13c. Jay, Publishers, 6054-P Kenwood, Chicago.

ATTENTION. Yale Clothing, Meriden, Connecticut, established 1900. Offers blue cheviot pants, \$2.50; raincoats, \$2.50; durable leather blucher shoes, \$2.50; windbreakers, \$2.50. Send sizes with money order.

2799% PROFIT. Griffin invested \$40, made \$1125. His report and our catalog free. Grinstead, 505 Fifth Avenue, New York.

NORTH Pole anti-freeze prevents frozen radiators; cost 15c a gallon, sells \$1.50 up; formula \$1.00. Mixed sample 25c. Nu-Way Sales Co., Box 243, Hornell, New York.

OPERATE Route penny gum and peanut machines. Steady cash income. Send stamp for particulars. Park Place Supply Co., P. O. Box 1983, Houston, Texas.

10c BRINGS Copy National Mail Order News, Box 1773-PM2, Roanoke, Virginia.

6,400—\$1 BOOKS Sold by mail through small advertisement. Cost 6c each. Also brings repeat business. Book and plans 25c. Box 2695, Hollywood, California.

START Home Business replating fixtures, tableware, etc. Easy factory method. \$5.00 course now \$2.00. Ideal, 179P, Park Ridge, Ill.

OPERATE Electric simonizing station. Cash in on national advertising with proved labor-saving invention. Only \$29.50. Should net you approximately \$300-\$400 month. Write Bissell's Mfg. Co., 3320-P Archer, Chicago. Distributors wanted.

QUARTERS. Dimes, daily by mail, complete plan with samples, dime, refund coupon included. Thomasson's, Minneapolis, Minnesota.

START Home business. Wonderful opportunity. Enormous profits made by many. Money making plans, formulas, etc. Free particulars. Barrymore, P. O. Box 784, Altoona, Pa.

POPCORN. Crispette, caramels, potato chip, salted nut machines. Long Eakins, 1940 High St., Springfield, Ohio.

BUILD Permanent business that will pay you far more than working for someone else. Our proven success plans tell you how. Profits begin immediately. Booklet free. Imperial Food Products Service, 2841 Girard Ave., Philadelphia.

"THE Mail Order Helper" 10c. Fox 608 Rogers Ave., Brooklyn, N. Y.

AMAZING Opportunity! Learn to make genuine rubber molds. Instructions free. Stewart's Studio, 2927 Wilcox, Chicago.

MAIL Business, spare time. Free details. Floyd J. Rose, Meriden, Conn.

REPAIR Upholstered furniture. Highly profitable, full or spare time business. Illustrated instruction book covers most common repairs, estimating, where to buy supplies, etc. Price \$2. M. Swider, Dept. B, 260 19th St., Brooklyn, N. Y.

WE Buy from you. Product easily obtained everywhere. Write Superior Supply Service, Springfield, Ill.

EARN \$25 Weekly working two hours daily. No canvassing or manufacturing. No investment necessary. Business Opportunities, Dept. 44, Box 5001, Saint Paul, Minn.

PLASTEX Industries offer industrious men an opportunity to start a business of their own, manufacturing art goods, novelties and utility products in Plastex and marble imitation. 1/2c materials makes regular 10c store sellers. Rubber moulds furnished for speed production. Small investment brings big returns. Nationwide demand in these low priced goods for coming X-mas holidays. Ambitious men have chance for real prosperity. Plastex Industries, Dept. A, 1085 Washington Ave., New York.

MANUFACTURE Polishpuffs. Amazing proposition 10c. Particulars free. Hickory-dell, Glenbeulah, Wis.

FREE Particulars hundreds of money making business opportunities. Lerner, G. P. O. Box 238, Brooklyn, N. Y.

WE Start you in business, furnishing outfits and instructions, operating Specialty Candy Factory home. Men and women, earn \$25 up to \$60 weekly, all or spare time. (Our 29th year.) Booklet free. W. Hillier Ragsdale, Inc., Drawer 4, East Orange, N. J.

PUBLISH A magazine of your own. Start a mail order business on small capital. Instructions and sample of magazine 10c (coin). Dickson Bureau, 2221 Mahon St., Pittsburgh, Penna.

LIQUID Marble—anyone can make! Colorful, glazed! Moulded, brushed, sprayed. Rubberlastic moulds. Composition flooring. Big money in these! Particulars free. Marbleizing Service, Edwardsville, Ill.

SUCCEED With your products. Make-sell them. Formulas. Processes. Accurate analyses. Catalog free. B. Thaxly Co., Washington, D. C.

DONUT. Potato chip, cheese pop corn. Home made. Big profits. Vanderpol, Springfield, Ohio.

PROFITABLE Home business. Legitimate. No canvassing. Maywood Publishers, P-923 Broadway, New York.

INVENTION Finance Magazine, 80-G Wall St., New York. Year subscription 60c entered upon promise to pay on receipt of first copy.

MAKE Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1950W Broad, Richmond, Va.

SELL By mail. Books, novelties. Bargains! Big profits! Particulars free. B. Ellico, 438 N. Wells, Chicago.

FREE Booklet describes 107 plans for making \$20-\$100 weekly, in home or office, business of your own. Elite Co., 214 Grand St., New York.

I WANT To send you proof of the wonderful pulling power of Popular Mechanics Magazine's classified pages. What's your proposition? Write me today. F. W. Johnson, Manager Classified Advertising, 200 E. Ontario St., Chicago, Ill.

CHARTERS: Delaware; best, cheapest; free forms. Colonial Charter Co., Wilmington, Del.

CASH Every week clipping and preparing news items for publishers. Simple, fascinating work. Experience unnecessary. Stamp brings information. Division 55, National Press, 3923 W. Sixth, Los Angeles, Calif.

HOW And where to obtain capital fully explained. Free particulars. Star Service, Wapakoneta, Ohio.

DELAWARE Charters: Complete service \$35. Submitted forms. Chas. G. Guyer, Inc., Wilmington, Del.

ARTIFICIAL Marble sanitary flooring. Instruction covering wood or cement flooring 1/2 inch thick, fireproof, all colors, low cost, ornamental casting, concrete, plaster, papier-mache, garden furniture, statuary, flexible molds, particulars free. Chris Mahler, Elmont, N. Y.

MAIL Order business is your opportunity. Many began small, now earn thousands yearly. No personal contact. Boundless opportunities. Have had over 30 years experience; will help you succeed. Send 25c for valuable booklets, none free. B. Brenner, 257 S. 21st, Philadelphia.

100 PROFITABLE Mail order and local plans. Gilbert Supply, 1107 Broadway, New York.

ZERPID. Fertilizer, 25c. Necessity for thousands. Sanquist Co., Pomeroy, Iowa.

MONEYMAKING OPPORTUNITIES

BE Independent. No canvassing. Write Leslie, 3415 Fort Independence St., New York City.

MAKE Your hobby pay. We can suggest how. Ulrichs, 5419 Windsor Ave., Chicago, Ill.

MONEY Making opportunities! Big profits! Particulars free! Seco Service, Box 337, Alice, Tex.

BUSINESS Proposition resilvering mirrors, autoparts, reflectors, making chipped glass signs. Write, Sprinkle, Plating, 287, Marion, Ind.

MAKE More money. Profitable particulars free. Ralph Underhill, Beebe, Ark.

HOME Opportunities, money making plans, ideas, 10c. Otto Grube, Egg Harbor, N. J.

"SCHEMER" Magazine, Alliance, Ohio, supplies schemes, tips, ideas, formulas; winners! \$10,000 to \$25,000 reported. 39th year, \$1. Special: trial six months only 30c, year, 50c.

\$10 DAILY With authentic prosperity plans. 40c profit. Field unlimited. Literature free. Box 344, Summit, N. J.

MAKE honest money at home. Free details. John Grady, Cosman Apts., Ilion, N. Y.

DOLLARS Daily, gathering and selling names for profit. Complete plan 25c. Prieman, Box 193, Union City, N. J.

OPPORTUNITIES Galore—free! M. Murphy, 335 Manchester, Manchester, New Hampshire.

INCREASE Your earnings. Send for unusual budget of money-making opportunities. Euvico, Walnut Street, Statesville, N. C.

UNUSUAL Books, novelties. Interesting literature free. Novelty Shop, Downsville, Louisiana.

PROFITABLE Homework opportunities. Stamp brings particulars. Goldsmith, 1726 Roosevelt, Chicago.

PROFIT In vegetables, flowers, using chemicals. Remarkable yields. Quick growth. Experiment now. Proven formulas. Enough chemicals for 40 gallons solution and instructions \$1.00 postpaid. Quick Growth Solutions, Hollywood Sta., Box 648, California.

MAKE Splendid profits in your own home. Circular free. Moose, 275 Post St., San Francisco, Calif.

MONEYMAKING Propositions, formulas, list, 10c. Davis, Box 3004, Bridgeport, Connecticut.

\$25.00 WEEK. Repairing sewing machines. Be independent, book real instructions \$1.00. Connan, 508 S. W. Second, Portland, Ore.

SENSATIONAL Opportunities! Particulars free. Sine, 323 South Eighth East, Salt Lake City, Utah.

STOP Squealing—Start crowing! Work mornings home—drive to country—"movies"—afternoons! No canvassing! Folio-A, Station "D," Los Angeles.

START Profitable mail order business at home. Stamp brings details. Success Publishers, 5623 So. Flores, San Antonio, Texas.

DIME Brings "Buckeye Buzzer," 52 page magazine. Profitable plans, tips, cashing-in opportunities. Publisher, 257pm N. Washington, Tiffin, Ohio.

TURN Spare time into cash with typewriter! Addressing envelopes, mailing circulars, typing! 25c (coin) brings information. Ace TPM-6, 322 Empire, Birmingham, Ala.

SPARE Time propositions that pay. Complete instructions, big mail, dime. Thomasson's, Minneapolis, Minn.

OVER 100 Ways to make money. Home or office. Three months latest offers and our magazine, "Dividends," 25c coin. Texas Sales Office, Weslaco, Texas.

RESILVER Mirrors, build big business. Easy factory methods. \$5.00 course now \$2.00. Ideal, 178P, Park Ridge, Ill.

QUICK Home cash. Starting outfit free! Tell Service, PMD, 1451 Broadway, New York.

35 MAIL Order plans, real money-makers; 2 sample plans 10c. Barnes, Oakland Beach, R. I.

MAN In each town to plate auto parts, reflectors, bicycles, fixtures, mirrors, by late method. Simple plan of manufacturing at home starts you in good paying business. Free particulars and proofs. Gunmetal Co., Ave. N, Decatur, Ill.

UNUSUAL Mail order proposition. Big profits. Box 424, Anderson, Ind.

NEW All profit plans. Kurtz, 3541 94th St., Jackson Heights, N. Y.

RAISE Earthworms for profit. Information free, stamp appreciated. Bureau Zoological Research, 106A Broadway, Peoria, Ill.

132 PAGE Mail order trade directory for \$1. Roth Products, Box 535, Kiefer, Okla.

PROSPERITY For home workers. 52 page magazine. Sample dime. Sizemore, 4917 N. Kostner, Chicago.

MILLIONS Jobless! Get dollars in mail daily, like we do, for amazing employment information. Keep money; we fill your orders free. Stamp brings details. Co-Operative Service, 77 Swan, Buffalo, N. Y.

MOULDS. Guaranteed, for casting toy soldiers, Indians, trappers, warships, sinker moulds, 244 kinds. Send 5c for illustration-catalogue. Henry C. Schiercke, 645 Spencer, Ghent, N. Y.

EASY To earn \$50-\$100 extra cash monthly during spare time. Operate your own business from home. Write for free particulars. Dixon Co., Box 776K, Springfield, Mass.

WHOLESALE Sources, 500,000 articles. Free directory. Maywoode, 925 Broadway, New York.

NEW Mailorder and local opportunities. Merchants Sales, 617M N. Second, Milwaukee, Wis.

107 PLANS For making \$20-\$100 weekly in home or office business of your own. Descriptive booklet free. Elite Co., 214 Grand St., New York.

LIKE To draw? Earn steady income tracing and duplicating advertising cartoons. Ad-Service, Argyle, Wis.

FORMULAS, PLANS, ETC.

FORMULAS. Analysis, free literature. Herstein, 128 So. Diamond, Grand Rapids, Mich.

THREE Mirror formulas \$1.00; gold, silver, gunmetal. H. Bledsoe, 24 "G" St., Benicia, Calif.

WATERLESS Soap, wonderful for mechanics, fabrics. Formula \$1. Jerome Jones, Hollins, Alabama.

FOUR Money making anti-freeze formulas \$1.00 cash. Lamoureux, Box 40, Hampden, Mass.

GUARANTEED Formulas—New fast sellers. None better. Lowest prices. Catalog free. Kemco, 49K, Park Ridge, Ill.

GREATEST Formula offer ever made. Manufacture modern products. Write for special prices. Philarist Company, Jefferson City, Missouri.

ANALYSIS. Research. Newest guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, BD-1142 Sunnyside, Chicago.

ORDER Your formulas from experienced chemists. Anything analyzed. Duplication guaranteed. Associated Chemists, Indianapolis, Indiana.

COMPLETE Chemical service. Newest guaranteed formulas. Research analyses. Valuable literature free. Special low prices. Miller, Chemist, 1706-L Tampa, Fla.

2799% PROFIT: Griffin invested \$40, made \$1125. His report and our catalog free. Grinstead, 505 Fifth Avenue, New York.

100 MONEYMAKING Formulas 25c. Descriptive literature free. Harvey Teeple, Decatur, Ind.

THAXLY Formulas for perfect products. Accurate analysis assured. Resultful research. Catalog free. B. Thaxly Co., Washington, D. C.

MAKE Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1950W Broad, Richmond, Va.

FORMULAS. Latest money makers. Literature free. Belfort, 4042 N. Keeler, Chicago.

CHEMISTRY

BUNSEN Burner for natural gas, new style. It stays lit, develops up to 2000 F. \$1.00 postpaid. Free plans for inexpensive natural gas generator. Angelus Mfg. Co., Box 885, San Angelo, Tex.

RARE Chemicals. List, sample for dime. Ernest Snow, Lexington, Massachusetts.

CHEMICALS For all purposes. Equip your laboratory! Catalog 10c. McBee Chemical Company, 1624-K Boren, Seattle.

ANALYSIS. Research. Newest guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, CT-1142 Sunnyside, Chicago.

HANDBOOK For chemical experimenters, hundreds of experiments, illustrated, 50c. Experiment booklet, 15c. Chemical catalogue, 10c. Reading Scientific Co., Reading, Penna.

RUBBER Latex. Dime brings literature, twenty experiments. Eastern Latex Labs., Box 53, Canton, Mass.

FREE Chemistry catalog. Supplies at 5c! Equip complete laboratory. Send 3c for postage. Kemkit Scientific Corp., 397P Bridge St., Brooklyn, N. Y.

CHEMICALS. Laboratory glassware, apparatus. Send 5c for catalog CP-1. Biological Supply Co., 1178 Mt. Hope Ave., Rochester, N. Y.

AGENTS WANTED

STARTLING Invention—Pocket adding machine. (Metal) no toy. Adds up to million. Retail \$2.50. Whirlwind seller. Big profit. Write quick for free sample offer. Calculator Machine Co., Box 1118, Chicago.

NEW Wrist-action plug ends linking and twisting; prevents broken wires and burned fuses. Easy to sell. Big profits. Free sample offer. No-Tro Electric Appliance Corp., 821 W. Erie St., Chicago.

500% PROFIT Selling new 20-in-1 kitchen utensil. Retail \$25c. Costs you \$1 a dozen or \$6 a gross. Sample 10c. New Method Co., PM-60, Bradford, Penna.

NEW Soapless cleaning discovery! Amazing seller homes, everywhere. Sales guaranteed. Free samples. Chicago Products, AA-3968 Avondale, Chicago.

YEAR 'Round income selling typewriter ribbons, carbon paper to offices. Olson's Advertising Service, 225 W. 5th Ave., Gary, Ind.

55% COMMISSION Handling out gift cards. Information and outfit 25c. Streamline Distributors, R3, Pleasantville, N. J.

ATLAS For best gold reflecting window sign letters. Large sizes 3/4 cent each. Free samples. Atlas, 7941 Halsted, Chicago.

AMAZING Windshield defroster. Strange new chemical instantly removes frost, sleet, ice. Desperately needed. Samples sent on trial. Rush name. Kristee, 127, Akron, Ohio.

300% PROFIT In new perfected (1937) quick action self-starting cigar lighter. No flint or friction. What makes it light? No wind can blow it out. Retail \$50c. Sample and can of fluid 25c. New Method Co., New Method Bldg., Box PM-60, Bradford, Penna.

PORTRAIT Agents, cut prices, portraits, frames. Catalogue free. Friedman's Studio, 528 Cornella, Chicago.

LOCAL Agents wanted to wear and demonstrate free suits to friends. No canvassing. Up to \$12 in a day easy. Experience unnecessary. Valuable demonstrating equipment, actual samples free. H. J. Graves, Pres., 1300 Harrison, Dept. Z-817, Chicago.

SELL New and used clothing! Over 100% profit. Selling experience unnecessary. We start you furnishing everything. Catalogue free. Acme Merchandise, AL-1219 S. Jefferson, Chicago.

KLEEN-GLAS—Fast repeating 10c polishing and cleaning bag for garage, car owner, home. Big profits, sample 4c. Rex-Hide of Pennsylvania, Inc., E. E., Pittsburgh, Penna.

GENUINE Remington portable typewriter for 10c a day! Men wanted to take orders for this remarkable bargain. M. N. Rand, Remington Rand, Inc., 315 Fourth Ave., Dept. M-50B, New York.

BUSINESS Proposition, restlivering mixers, autopaets, reflectors, making chipped glass signs. Write. Sprinkle, Plater, 128, Marion, Ind.

STRANGE Ironing cord. Prevents scorching. Saves electricity. Abolishes kinks and snarls. For telephones also. 150% profit. Sales guaranteed. Samples furnished. Neverknot, Dept. 12-A, 4525 Ravenswood, Chicago.

AT Home, your own manufacturing business, making popular \$1 novelties. Cost you 3c to 15c. Everything supplied. Write So-Lo Works, Dept. Z-842, Cincinnati, Ohio.

COROSO Ring—Hand made, engraved initials. Make money. Samples 50c. Protected territory. Santos Hermanos, Mayaguez, Puerto Rico.

BIG Money applying initials on automobiles: \$1.45 profit on each sale. Write for particulars and free samples. American Monogram Co., Dept. 48, Dunellen, N. J.

450% PROFIT Quick-Action automatic gas lighter. No flint. 25c seller to every home, office and restaurant. Free sample. New Method Co., Box PM-60, Bradford, Penna.

500% PROFIT! Gold and colored sign letters for windows, offices, trucks, signs. Auto monograms. Easily applied by agent or customer. Neonite, Akron, Ohio.

ENGRAVE Your own Christmas cards, stationery. Signature raises changes to gold. Sample 25c. Williamseo, Box 765, Wilmington, Del.

500% PROFIT! Gold reflecting letters for store windows. Large sizes 1c. Free samples. Modernistic Sign, B-3004 Lincoln Ave., Chicago.

AMAZING New scientific discovery cuts coal bills 40% to 60%. 75c package treats a ton. Every home and building a prospect. Agents cleaning up. Call for demonstration or write. WCS Products Co., Beverly, Mass.

MEXICAN Feather pictures. Christmas novelty. 4x9" costs 25c including duty, retail \$1. Sample 30c stamps. Marquez, Apartado 1176-P, Mexico City.

MAKE Money without selling. Strange new idea pays Woman \$410 in 2 weeks. You start by giving something away free to friends and neighbors. Tremendous business growing by leaps and bounds. What you make depends entirely upon how many free articles you pass out. It's sizzling hot! Complete instructions sent free. No sample outfit to buy. Nothing to sell. Hurry. Garden City, 6227 Broadway, Dept. C-1212, Chicago.

MEN-WOMEN—Wear fine hose I send without cost with outfit while taking orders for amazing new hosiery. Replacement guaranteed against holes, snags, and runs. Rush name and hose size. Wilknit, Desk 12B37, Greenfield, Ohio.

A SURE Cure for clogged drains. This tool sells on sight. Get a city and become independent. Silent Valve Co., 3420 Fletcher Drive, Eagle Rock, Calif.

NEW Sensation—Big commissions. Chamois-cloth metal polish. Full size sample 25c. Midwest Chemical, 1545 N. 17th, Omaha, Nebr.

NU-PLATE! Just rub it on—it plates! Instant demonstrator. Excellent profits. Sample 25c. Details free. Gee-Tee Products, P-608 Evergreen Ave., Brooklyn, N. Y.

SELL Something new. A sure repeater, 200% profit. Handle alone or with your present line. Sample 25c. Details free. Warrenfelt Supply Co., Indianapolis, Ind.

OVER 100% Profit selling glove and muffler, tie and handkerchief, hose and tie sets. Many other novelties. Write for catalog of 42 money makers and free sample swatches. Boulevard Cravats, 22 West 21st St., Dept. M-79, New York.

MAKE Pull strength, non-explosive, non-inflammable, odorless cleaning fluid from benzene crystals, 1c gallon. Sample 25c. Literature free. Western Reserve Laboratories, 6815 Denison Ave., Cleveland, Ohio.

MONOGRAMMING Automobiles biggest money maker today. New type requiring no varnish to apply. Write for samples. International Monogram & Transfer Co., Box 9360, Philadelphia, Penna.

"THE Pocket-Print-Press" prints signatures, handwriting, in black, blue, green, red, on Christmas cards, stationery, linen (wash proof) 3000 imprints. Retail \$1.00. Agents \$3.50 dozen. Sample 50c. Sinaprint, 24 West 61st, New York.

BIG Profit selling new typewriters and fabric "dry cleaning fountain brush." Retail \$1.50. Write quick for amazing proposition. Rivet-O Mfg. Co., Orange, Mass.

PROFIT With new products. Make, sell, repeat. Analysis. Research. Guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, BD-1142 Sunnyside, Chicago.

AGENTS—Newly developed polishing wax for autos sells when other won't. Positively will not rain-spot. Big profits. Send 50c for full size can. Details free. Protective Coating Co., 2242 Elston Ave., Chicago.

NEW Tinselled Christmas signs, 11x14; cost 5c—retails 25c. Make Christmas money. Sample free. Lowy, Dept. 745, 8 West Broadway, New York City.

1,000 JUMPING Beans, \$1.60 postpaid. Also feather pictures, tablecloths, leather, lace-work, others. Phenomenal profits! Generous samples, 50c stamps. Free particulars. Marquez-P, Apartado 1176, Mexico City.

I'LL Give you groceries at wholesale besides splendid opportunity to make up to \$45 in a week. Brand new Ford sedan given as bonus. Details free. Albert Mills, 2461 Monmouth, Cincinnati, Ohio.

THYDRO-X (Extra miles). Tremendous profits. Distributors wanted. Thermo-P Works, Peoria, Illinois.

SELL Novelty fun cards, novelties, etc. Samples 10c. National, Box 500M, Cincinnati.

COMPLETE Chemical service. Newest guaranteed formulas. Research analyses. Valuable literature free. Special low prices. Miller, Chemist, 1706-L Tampa, Fla.

FREE Sample dehydrated ink. Agents wanted. Exclusive territory. One pint 10 cents. King Permanent Ink Co., 912 Holland Bldg., St. Louis, Mo.

STEADY Work, good pay. Reliable man wanted to call on farmers. No experience or capital required. Pleasant work. Home every night. Make up to \$12 a day. Wonderful new proposition. Particulars free. Write McNess Co., Dept. 5, Freeport, Ill.

MEN And women wanted: Sell Xmas signs, tree lights, cards, gifts, etc. Free wholesale catalogue. Liberty Sales, Dept. P, 24 E. 21st St., New York.

MAN In each town to plate auto parts, reflectors, bicycles, fixtures, mirrors, by late method. Simple plan of manufacturing at home starts you in good paying business. Free particulars and proofs. Gunmetal Co., Ave. H, Decatur, Ill.

SIGN Letters for store and office windows; 500% profit. Free samples. Metallic Co., 438-B N. Clark, Chicago.

BIG, Steady weekly profits for men and women with cut price food route. More than 300 fast selling household and farm necessities. Sensational premium deals get quick cash and build profitable routes quickly. Write Bleecker, 259 E. 4th St., St. Paul, Minn.

NORTH American oil burners. No experience needed. Free particulars. Wrenn Oil Burner Service, Nashua, N. H.

SELL Comic Christmas seals. Sensational! Different! Sample set 10c. Rogge, Grayslake, Ill.

AGENTS—To mail our literature. Good profits. Home business. Maywood, 149 Fifth Ave., New York.

AGENTS: Smash go prices. Santos coffee 12c lb., 4-oz. vanilla 8 1/2c. Razor blades 10 for 8 1/2c. 100 sticks chewing gum 12c. Christmas cards, 21 in box, 14c. 150 other bargains. Premiums. Experience unnecessary. Carnation Co., PO, St. Louis, Mo.

SUCCEED With your products. Make-sell them. Formulas. Processes. Accurate analyses. Catalog free. B. Thaxly Co., Washington, D. C.

MAKE Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1950W Broad, Richmond, Va.

AGENTS—Opportunity to make money; book containing 107 successful business plans; home or office; send for free introductory booklet. Elite Co., 214 Grand St., New York.

FREE Sample—Amazing cleaner; sells homes, taverns, everywhere. Big profit—fast repeater. Betco, 5007 Irving Park, Chicago.

WANTED — District purchasing agents. No experience or money required. Write Purchasing Manager, 174 N. Halsted, Chicago.

DO You want agents for your proposition? Your ad in this space will place your message before hundreds of men seeking fast-selling products. My folder "How to Secure Agents," is filled with proof. I'll gladly send you a copy free. F. W. Johnson, Manager Classified Advertising, Popular Mechanics Magazine, 200 E. Ontario St., Chicago.

BIG Money taking orders: shirts, ties, hosiery, underwear, raincoats, dresses, etc. Sales kit free! Experience unnecessary. Write Nimrod, Dept. 8, 4922-28 Lincoln Ave., Chicago.

MANUFACTURE Specialties, hire agents yourself. Big money. Free literature. Gilbert Supply, 1107-P Broadway, New York.

ENGRAVED Name plates, numbers, signs, etc., easily sold, profits large. Brett Bros., Winthrop, Mass.

AGENTS: Stamping names on pocket-key protectors. Sample check with your name, address, 25c. Stamping outfits. Emblem checks, check-fobs, name plates. Hart Mfg. Co., 303 Degraw St., Brooklyn, N. Y.

HIGH-GRADE SALESMEN

SELL Nothing. \$95 weekly. \$500.000 punchboard firm announces new, no investment plan. Season starting. K&S, Dept. C1212, 6227 Broadway, Chicago.

BIG Season now! Sell America's most complete line of printing necessities, advertising book matches, gummed labels, political items, pricing sets, restaurant supplies, complete line sales books. Process engraved-like stationery. Also beautiful line of colorful Art Wall and Metal Calendars, holiday novelties, Christmas greeting cards for personal, business and professional use. Thermometers, ash trays, advertising pencils, business stimulants, and hundreds of other fast sellers. All competition undersold. Cash commission advanced daily plus extra bonus. Free gifts. Experience unnecessary. Huge complete outfit free. Northwestern, K-625 Jackson, Chicago.

REMINGTON Rand will employ local representatives for portable typewriter division. No experience or investment. Unusual opportunity for reliable man. Write M. N. Rand, 315 Fourth Ave., Dept. M-50A, New York.

GUARANTEED Gold leaf letters for store windows. Free samples. Liberal offer to car owners. Metallic Co., 438-A N. Clark, Chicago.

AMAZING Invention closes all doors silently, automatically. New oil principle. Easily installed. Never needs attention. Priced dollars less than other checks. Unlimited market stores, offices, factories. Free demonstrator furnished workers. Kant-Slam, Dept. Z-62, Bloomfield, Ind.

SALESMEN—Sell calendars. Complete line, all sizes, including jumbos; beautiful subjects. Samples free! Flemming Calendar Co., 6543 Cottage Grove, Chicago.

WANTED County distributors. Excellent opportunity for earnings. Nationally advertising product. Large company. Dept. 251 Fyr-Fyter Co., Dayton, Ohio.

MEN Wanted by world wide industry. Write today for particulars about few good old Raleigh routes that have paid well for years. Established, profitable business. Over 200 farm and home necessities. Industry and reliability main qualifications. Man with auto preferred. Give age, experience, references. Raleigh's, Dept. LN-PPM, Freeport, Ill.

SELL Grooved felt back changeable signs with double prong celluloid letters to all stores. Big commissions. P. Pricing Press, 124 White St., New York.

ADVERTISING Book match factory offers you amazing opportunity. We are largest in world selling direct. Big cash comm., bonuses. Full-part time, big repeats. Samples and kit free. Match Corp. of America, Dept. E-12, 6041 Grand, Chicago.

EARN Big cash daily. Sell shirts with sensational Firm-Edge collars. Always neat and comfortable. Ties, hose, underwear also. All guaranteed one year. Biggest selection; cash commissions daily. Cash bonuses regularly. Sales outfit free. Write, Dept. P-12, Rosecliff-Quaker, 1239 Broadway, New York.

WANTED—Men for good paying work with a large shoe company. Good pay every day. Free shoes as bonuses to "go-getters." No experience needed. Complete sales outfit sent free. Write Consolidated Shoe System, Dept. M7, Chippewa Falls, Wis.

SALESMEN—Sell business stationery, \$2.65 thousand. Calendars, book matches, advertising pencils, shelf moulding, labels, salesbooks, pricing sets. Business cards \$1.50 thousand. 35% comm. daily. Free deals. Sales portfolio free. David Lionel Press, 312 S. Hamilton, Dept. V8, Chicago.

ATLAS For best gold reflecting window sign letters. Large sizes 3/4 cent each. Free samples. Atlas, 7941 Halsted, Chicago.

NEW Punchboard assortments. Free large colored catalog. Nothing to carry. Larger cash commissions daily. Season now! Addwill Sales Co., 180 Adams, Chicago.

NEW! Premium advertising deal. Merchants sales builders. 109B N. Dearborn, Chicago.

SALESMEN: Exclusive "Attractive Art Advertising" calendars, metal desk specialties, ash trays, thermometers, automobile novelties, funeral directors services. Biggest season beginning. Apply immediately. Advertisers Publishing Co., Ann Arbor, Mich.

MYSTERY Electric sign. Third dimension. Salesmen coin money showing to merchants everywhere. Get details today. Jones Brothers, Merchandise Mart, Chicago.

NO Selling! Steady work. Big pay daily. Be my local buyer. Money furnished. Details free. Pruitt, Co., 1180 Pruitt Bldg., Chicago.

TIREX Opens huge market for salesmen. Motorists and truck owners amazed by demonstration. Sales increasing phenomenally. Salesman write for exclusive territory—today. Tirex Corporation, 720 N. Michigan, Chicago.

SALARY Or commissions. Permanent. National Salesmen's Bureau, Taylor Bldg., Rochester, N. Y.

SELL Planographed printing. Easy to sell, big commissions paid daily. No more cuts necessary. Illustrate freely. Free illustrated catalog. American Offset Printers, 1240 South Main St., Los Angeles, California.

TIRE Accessories. Guaranteed 10,000 mile Tiger Grip Tire Patch, and complete fast-selling line auto accessories. Salesmen-distributors easily make up to \$75 weekly, and over. Protected territory. Economy Rubber Products Co., 838 Burkhardt, Dayton, Ohio.

TWO \$5.00 Genuine pig grain jackets given free on newest sales plan that sells for \$6.95. Amazing profits. Grund Art & Novelty Company, 421A East Walnut Street, Des Moines, Iowa.

SELL New "Shavease" brush. \$1.00. Universal need. "Shavease," 1100 Lincoln Ave., San Jose, Calif.

REAL Salesmen-Distributors. Do you want something new to sell with over 2 million sales outlets? It will surprise you! Extraordinary repeater and money-maker. Sell business places only. A product of merit. Mail postal for details. Protected territory going fast. The Cumberland Corporation, Fayetteville, North Carolina.

EXCLUSIVE Representatives appointed. Faucet water softener. Revolutionary. Luxosoft, Sausalito, California.

SALESMEN To sell hardware stores and garages. Powerful new fast-selling specialty. Liberal commissions. Repeats. Coronado, St. Paul, Minn.

SALESMEN—Make a day's pay in a few hours selling most complete line stationery, business cards, memo books, advertising novelties, etc. Free cut service. Commissions daily. Complete selling outfit free. Interstate Printing, Dept. PM, Biglerville, Pa.

SELL Crofoot stapling devices, for shade shops, shippers and screen makers. Repeat sales of staples will establish profitable business of your own. J. B. Crofoot Co., 223 Evergreen Ave., Mount Prospect, Ill.

JOBBER. Distributors, salesmen. A-1 side. Qualify state right. Counter display rat poison, worm capsules. Write samples. Vosburgh, 452 Hudson, Oakland, California.

SALESMEN: Driving the hi-ways, here is your gas, oil, meal money and more calling on gas stations, retailers. Sure-fire sales stimulator requires few minutes to sell, paying excellent advance and repeat commissions. Write for pocket sales kit today. H. Meinhardt, Dept. 17, 18 E. Kinzie, Chicago.

ADVERTISING Matches, calendars. Main or sideline. Big commission with order. Cash bonus. Free matches. Big new outfit free. Gem Match, 74-P W. Washington, Chicago.

TOOL Salesmen: sell new inexpensive electrical trouble shooter. Every repairman buys on demonstration. Many making \$75 weekly as side line. Factory, 2812 Gilham, Kansas City, Mo.

MAKE More money with Red Comet Automatic Fire Extinguishers. Low price. Proved seven years. Splendid sales outfit free. Some good territory open. Exclusive. Write quick. 704 Red Comet Bldg., Littleton, Colo.

BE Your own boss. Make the largest commissions selling our complete line of brushes. Write for sales plan. Wire Grip Sanitary Brush Corp, 220 Southern Blvd., New York.

BRUSH Salesman—If you ever sold brushes write for our money making proposition. Donald Brush Co., Camden, N. J.

NEW Specialty—Sells every business and professional man. Four \$15 sales daily pay \$280 weekly. Ferrell cleared over \$1,000 monthly. Write, F. E. Armstrong, President, Dept. PM, Mobile, Ala.

FREE Booklet describes 107 plans for making \$20-\$100 weekly, in home or office, business of your own. Elite Co., 214 Grand St., New York.

SPARKLING Glo-Brite signs sell fast to stores, restaurants, taverns. Lasting gold finish. Plenty profit. J. A. Baxter, Cambridge, Ohio.

BIG Money taking orders: shirts, ties, hosiery, underwear, raincoats, dresses, etc. Sales kit free! Experience unnecessary. Write Nimrod, Dept. 65, 4922-28 Lincoln Ave., Chicago.

DISTRIBUTORS—CREW MANAGERS

DISTRIBUTORS — Nationally known manufacturer of an inexpensive amazing electric arc welder, electric pipe thawer and unique motor starter will give exclusive territory to men who have had successful selling records and would like to have a business of their own, or established firms that wish to expand and increase their present profits. Hercules, 24 E. 22 St., New York.

HELP WANTED

STOP Job-hunting. Be your own boss. Start profitable mail order business of your own. No selling. Write Hant Service, 516-X Federal St., Pittsburgh, Pa.

USE \$500? Raise canaries for us. Splendid sparetime money maker, fascinating work. We supply singers and buy back. Write for free particulars. Crimmins, Box 44B, Woodside, N. Y.

EDUCATIONAL AND INSTRUCTION

CHEMISTRY — Acquire a thorough knowledge of chemistry. Facts, laws and theories clearly explained in text used successfully many years University of Colorado. Many famous chemists and chemical engineers obtained their first fundamental knowledge of chemistry from this text. Post free \$1.25. University Book Store, Boulder, Colo.

AIR Conditioning, electric refrigeration industries demand trained men for installation, service, maintenance and sales. Qualify in 3 months. Free employment service. Established 34 years. Get new book "Step Up to Success" free. Write O. Werwath, President, 1020-N N. Broadway, Milwaukee, Wis.

BECOME An investigator—Secret service agent. New "Test Problem Method." Develops your ability. Particulars free. International Secret Service Institute, (PM127), Hoboken, N. J.

SCIENTIFIC Fingerprint Institute. Box 554, Worcester, Mass. Teaching authentic Henry system. Diploma to graduates. Course open to both sexes. Circulars free.

GOVT Jobs start \$1200-\$2100 year. Men-women age 18-50. Former examiner's tested method helps qualify you. Particulars, list jobs free. Write today. Patterson School, 80 Mercantile Bldg., Rochester, N. Y.

MEN—Women. Get government jobs. Start \$105-\$175 month. Prepare now for next examinations. Common education usually sufficient. Full particulars, list positions, free. Write today. Franklin Institute, Dept. K3, Rochester, N. Y.

500,000 USED Technical and business books. Sold, rented, exchanged. All subjects. Satisfaction guaranteed. Cash paid for used books. Complete details and illustrated bargain catalog free. Send name. Nelson Co., 4015 Manhattan Bldg., Chicago.

THIRTY-SIX Pages; instructions. Money-maker aplenty, 10c. "MooreMade," Lapeer, Mich.

MILWAUKEE Industries desire to contact earnest men to learn electric arc welding in their laboratories of the School of Engineering. Moderate training fee. For details write President Werwath, 1020-O N. Broadway, Milwaukee, Wis.

COMMUNICATIONS Engineering instruction. Wayne Miller, Suite 200, Engineering Bldg., Chicago.

SHORTHAND Simplified, complete, \$1. Folder-lesson dime. Simmons, Rocky Hill, Conn.

DIESEL Graduates, part or full time, send one dollar to Diesel Associates, 3127 Locust St., St. Louis, Mo.

PHOTO—Color. Complete course \$2.00. W. Greener, St. Johns, Michigan.

REFRIGERATION, Electric, taught by expert, twenty-six lessons, \$24.50. What an ideal Xmas gift. Henry School of Electric Refrigeration, Box No. 202, Detroit, Michigan.

LEARN Refrigeration! Write! Williams, 3941 Shaker Square Station, Cleveland, Ohio.

LEARN Fascinating profitable profession of Swedish massage in great resident school in Chicago. Short course. Write for free illustrations of massage technique. Low tuition. The College of Swedish Massage, 1601 Warren Blvd., Dept. C1, Chicago, Ill.

DEGREES Earned by home study in arts, sciences, philosophy, education, psychology, theology, law, chemistry, engineering, business, agriculture. McKinley-Roosevelt College, Chicago.

HIGHER Arithmetic solves problems quickly. Frederick A. Smith, 2410 Bernard St., Chicago.

MEN Wanted willing to learn landscape designing and fill big paying position as landscape architects. Free test of your natural ability and chance to win in \$750 contest. No experience needed to start. Earn while you learn. Write today for free test blank. American Landscape School, 837 Plymouth Bldg., Des Moines, Iowa.

SECRET Investigations. Excellent opportunity. Particulars free. Write George Wagner, M-2640 Broadway, New York.

EARN Extra money! Clipping and preparing newspaper articles for publishers. Simple; fascinating; profitable. Send stamp. Division 55A, National Press, 3923 W. Sixth, Los Angeles, Calif.

LEARN Machinist trade, tool, die making. Automatic and hand screw machines. Modern shop methods. Actual work. Jobs open for trained men. Employment help. Illustrated booklet free. Allied Screw Machine Co., 601 Lake St., Chicago.

MAKE More money. Get a U. S. government job. Get our new plan for obtaining one—no obligation. Age 18-50. Write Instruction Service, 101, St. Louis, Mo., immediately.

BECOME Business investigator. Make money in your spare time. Pleasant work, good fees. Details free. Business Detective System, 1009 Oak, Elmira, N. Y.

LEARN Auto mechanics, body, repairing, welding, electricity, refrigeration. Diesel. Stevenson's, 2008A Main, Kansas City, Mo.

MASSAGE. Hydrotherapy, dietetics, drugless therapeutics, chiropody, taught by mail. Evans Correspondence School, Montgomery, Ala.

BOOKS Covering hundreds of subjects. Big catalog for 3c postage. Popular Mechanics Press, Room (C37), 200 E. Ontario St., Chicago.

PLAYS—STORIES—MANUSCRIPTS

WRITERS: Studios pay \$2500 to unknown writers for screen stories or ideas. "Screenwriters Handbook" tells how to construct and sell your story or idea. Endorsed by studio story editors. Used by successful professional and amateur screenwriters. Send \$2 (total cost) or order COD today. Address Broadwell Studios, Dept. 242M, Bendix Bldg., Los Angeles, Calif.

MARKETING. Advisory service for writers. Free bulletin 5A. Don Wimmer, Route 7, Huntington, Ind.

POORLY Written stories revised for marketing. Welton Tinney, Winnaboro, Texas.

WANTED. Original poems, songs, for immediate consideration. Send poems to Columbian Music Publishers, Ltd., Dept. 209, Toronto, Can.

SHORT Stories revised, typewritten, marketed. Details free. Hursh Service, Box P-1013, Harrisburg, Penna.

CARTOONING, COMMERCIAL ART, SHOWCARD WRITING, SIGN PAINTING

ART Magazine. Helps you sketch, paint, model, carve, cartoon, draw human figure, sell drawings, exhibit, form clubs. Regular 25c copy for 10c while samples last. Artist, 18 E. 48, New York City.

LEARN Show card writing and sign painting. Earn from \$75 to \$100 weekly or start shop of your own. Particulars free. Dawsona, Box 20PM, Sta. J, New York.

AMATEUR Artists Magazine publishes your drawings. Prizes. Sample copy, information, (20c) coin. Art Reproduction Service, 126 Lexington Ave., New York.

PROFESSIONAL Lettering easy with Speedway Sign Kit. 12 modern alphabets, numerals, in five matched styles. Sizes to 3-in. Printed on E-Z-Kut parchment. Price \$1.00. Numerous others. Cost reasonable. Valuable 3-in. alphabet, 10c. Free samples, literature. Display Letters Co., Station 235-G, New York.

CARTOONING. Sketching, etc.—46 lessons, 600 illustrations, including drawing paper, pens, pencils. \$1.00 complete. Fraba Service, Cashton, Wisconsin.

SILK Screen process. See our ad under Printing Outfits. Artset Co.

EARN cash income, copying and duplicating simple cartoons for advertisers. 3-M Service, Argyle, Wis.

ADVERTISING AGENCIES—FOR ADVERTISERS

LEARN Advertising quickly at home. Easy practical plan. No text books. Common school education sufficient. Interesting booklet and requirements free. Page-Davis School of Advertising, 3601 Michigan Ave., Dept. 3431, Chicago.

33 WORDS. 25 Magazines, three months, \$2.00. Goodall, 742 Market, San Francisco.

ADVERTISE Profitably: \$15 reaches 6,000,000 Sunday newspaper readers with 24 word ad. Newspaper, magazine, rate-guide, free. Chicago Union Agency, 20 W. Jackson, Chicago.

FREE—New Advertisers Rate Guide, 44 pages. Includes everything. Lowest rates. E. H. Brown Advertising Agency, 140 S. Dearborn, Chicago.

ADVERTISING Placed anywhere. Helpful, free service. Rate guide book free. Baker Advertising Agency, 189 W. Madison, Chicago. Successors to Ankrum Advertising Agency. Established 27 years.

ADVERTISE: 3 Lines 100 national mail order publications \$4. Lists free. Advertising Bureau, 4513-C Cottage Grove, Chicago.

INCH Display advertisement 30 magazines year \$24. Wood's Popular Services, Atlantic City, (N. J.)

BUSINESS SERVICE

NEW York mail address. Business, personal. \$2.50 monthly. Bachman, 507 Fifth Avenue, (42nd Street.)

CHICAGO: Mail address; branch office; representation; \$1 monthly. Letters, etc. forwarded daily. Established 1919. General Service, 56 West Washington.

\$1.00 MONTHLY Maintains Atlanta, Georgia, office. Mailing Address, 244-6 Arcade Bldg.

FLORIDA Mailing address. Business or personal. Universal, P. O. Box 546, Jacksonville.

WASHINGTON, D. C., mail address. For business or personal purposes. \$2 monthly. Hawkins Mail Service, 817 Fourteenth.

TYPEWRITERS, DUPLICATORS, OFFICE DEVICES

NEW \$3.75 Automatic adding machine. Fully guaranteed. Bassett, Box 302D, Altadena, Calif.

TYPEWRITERS, Duplicators, multi-graphs. Write for free list office machine bargains. Save half. Pruitt, 518 Pruitt Bldg., Chicago.

INCREASE Business now. "Excelsograph" Rotary Stencil Printer reprints thousands everything you typewrite. Handwrite, draw or trace. Colors. \$19.75 to \$44. Terms. Illustrated literature free to business or professional men. Pittsburgh Typewriter Supply, Department K-2, Pittsburgh, Penna.

RUBBER STAMPS AND OFFICE SUPPLIES

NAME Address, 2 lines 25c; 3 lines 35c. Stamp Works, Auburn, Nebr.

DE LUXE Stamps, 2 lines 25c; 3 lines 35c. Stamp Works, Hastings, Nebr.

CUSHION Mounted, one-two lines 25c, three 35c; facsimile signatures \$1.50. Stamp Works, 814 Bradley, Peoria, Ill.

2 LINES 25c, 3 Lines 35c. Stamp Works, Centerport, N. Y.

PRINTING, MULTIGRAPHING, MIMEOGRAPHING, GUMMED LABELS

1000 BUSINESS Cards \$1 postpaid. Skilling the Printer, 2529 Telegraph Ave., Berkeley, Calif.

300 LETTERHEADS, 8½x11 And 300 envelopes, \$2 postpaid. Benneville, 907 W. Roosevelt, Philadelphia

PRINTING—Low prices. Prompt service. Send for estimates. Established 1912. Hunt, Printer, Morrisville, Penna.

NEARGRAVURE Embossed stationery, \$3.45 thousand. Distinctive. Samples. Soliday, Knox, Ind.

5000 6x9 CIRCULARS \$7.45. 250 Letterheads, envelopes or statements \$1. Roe Printing Co., Weldman, Mich.

1000 UNIQUE Advertising cards \$1.50. Rolland Marsh, Harbor Springs, Mich.

CUT Printing costs. Letterheads, envelopes, 6x9 circulars, statements, \$2.45, 1000. Samples. Economy Printing Co., Lancaster, Ky.

250 BOND Letterheads or envelopes \$1. Moyer, B-241-P, Milton, Pa.

LEADER Quality—250 business letterheads and envelopes, \$2. Cards, labels, statements. "Business Builder" economy. Thomas Wood, Massena, N. Y.

250 LETTERHEADS, 250 Envelopes, \$2.00. Balka, 1432 No. Washington, Dallas, Texas.

HAND Press, type and complete printers' supplies. Advise equipment you need and we quote prices; or send stamp for catalog. P. Peiffer, 26-B; 8 Columbia St., Newark, N. J.

QUALITY, Postage saving letterheads, ten dollars thousand, postpaid. Holiday packing if desired. Electron Print, Box 1539, New Orleans, La.

1000 RULED Statements, envelopes, \$2.00. Ruled billheads, letterheads. \$2.35. KPress, Box 103, Station W, Brooklyn, N. Y.

1000 6x9 CIRCULARS. Letterheads, envelopes, postcards. \$2.95; 5000, \$8.99. All printing reasonable. Samples. Cuts. Goodprint, Harrisonburg, Va.

EXTRA Special—500 envelopes and 500 letterheads \$2.50 postpaid. Bond paper. Guaranteed. Hustler, Advance, Indiana.

BUSINESS Cards 45c M. Maloney Sales, 84 Exchange, Rochester, N. Y.

LETTERHEADS Or envelopes \$2.00 per 1000. Victors Printery, Exeter, New Hampshire.

ENVELOPES 1000, \$1.75. Free samples. Prospector's Printing, 515 - 6th Ave., Brooklyn, N. Y.

PHOTO Engravings—Zinc line cuts made, 10 square inches. \$1 up; halftones; electro; artist; speedy; free price list. Ritteway Engraving, 1457P Broadway, New York.

SAMPLES — Attractive portfolio free. Lowest prices! Sanderson's Printing, Ottawa, Illinois.

1,000 BOOKS Advertising matches \$4.50. Sanderson's, Ottawa, Illinois. (Salesmen wanted.)

1,000 3 1/2 x 5 1/2 PRINTED Adcards \$2.39. Sample for stamp. Comstock, Charlestown, N. H.

BUSINESS Cards, \$1.00 1000 post paid. McBride Printery, 646 McBride Ave., Los Angeles, Calif.

5,000 6x9 CIRCULARS \$7.50. Prompt, prepaid. Catalog. Clarence Herr, Printer, Conestoga, Penna.

ARTISTICALLY Designed printing. Reasonable. Samples free. Barr, 1611 North Wells, Chicago.

PRINTED Bond letterheads, 1000 \$1.95. Mimeographing, 1000 \$2.85 postpaid. 20-lb. 8 1/2 x 11. Samples. Cop-Y-Cat, Box 840, Milwaukee, Wisconsin.

LETTERHEADS, Envelopes, 6x9 circulars, postcards, \$3.00, 5000. Perry Press, Albion, Maine.

BETTER Grade printing, reasonable priced. Free samples. Economic Press, Leona, N. J.

LABEL Specializers. Better values. Free samples. 6619H Quimby, Cleveland, Ohio.

6x9 CIRCULARS, Letterheads, statements, envelopes, \$2.95, 1000. Economy Press, Oconto, Wis.

500 3 1/2 x 2 1/4 FOUR Line gummed stickers, 25c. Moritz Printery, Saginaw, Mich.

QUALITY Printing. Lowest prices. Samples. Tucker Press, Box 63, Indianapolis.

PRINTING OUTFITS AND SUPPLIES

BUY Your printing equipment from one who started a large printing business with a hand press. Presses, type and supplies. Catalog free. Globe Press Co., Dept. A, 2608 Lawrence Ave., Chicago.

6x9 PRESS \$5. Bargain lists free. Novelty Shop, Downsville, La.

HAND Presses, type, supplies. Big lists 3c. Landis, Richland, Penna.

WANTED—Used hydraulic press, capacity 5,000 to 10,000 tons. Mojoanier Bros. Co., 4601 W. Ohio St., Chicago, Ill.

GOOD Used complete equipment bargain catalog free. Bradshaw, 3214-P Huron, Chicago.

PRINT Your own cards, stationery, circulars, advertising. Save money. Easy rules furnished. Print for others, big profits. Junior outfit \$8.85; job presses \$11. Details free. Kelsey Co., B-11, Meriden, Conn.

NEW Type 29c font. Catalog dime. National Type Co., Jackson, Mich.

HAND Presses, type, supplies. Send stamp for catalogue. Printers Sales, 114 S. Howard St., Baltimore, Md.

SILK Screen process. For showcards, signs, displays, etc. Decorating toys, furniture, novelties. On paper, cardboard, wood, metal, other products. Easily learned. Complete instruction. Particulars free. Artset Co., 637 Case Bldg., Rochester, N. Y.

BARGAINS, Presses, type, list 3c. Exchange D-15, 22 Orient, Meriden, Conn.

BARGAINS—Presses, type, supplies. Send stamp. 159 Harvard, Cambridge, Mass.

PATENT ATTORNEYS

INVENTORS: Send immediately for your copies of our new free books, "Patent Protection" and "Suggestions on Selling an Invention." Sixty-eight pages of interesting facts. They tell how patent laws protect you; kind of sketch or model needed; simple steps to take without cost; how successful inventors have secured financial assistance; show interesting inventions; illustrate important mechanical movements. With books we also send free Evidence of Invention form to help establish date of disclosure. Prompt service, reasonable fees, special deferred payment plan. Strictest secrecy. Thirty-six years experience. Highest references. Write us today. The facts in our books are worth money to the man with a good invention. Address: Victor J. Evans & Co., Registered Patent Attorneys, 900-P Victor Bldg., Washington, D. C.

PATENT Your invention with this responsible firm of Registered Patent Attorneys. Deferred payment plan. Over 62 years' experience. Write for two free books and "Certification of Invention." C. A. Snow & Co., Inquiries Division, Snow Bldg., Washington, D. C.

PATENTS—Before too heavy an outlay of time or money is made on an invention, a search of the Patent Office records should be made to determine as nearly as possible whether or not the same idea has been patented before. The cost of this search is small, while the value of the facts it uncovers is often considerable. We offer inventors and manufacturers a thorough prompt, confidential search service—plus experienced counsel and assistance in every phase of Patent and Trade-Mark practice. Write for our new free book containing valuable information relating to patent procedure. Clarence A. O'Brien and Hyman Berman, Registered Patent Attorneys, 586 Adams Bldg., Washington, D. C.

WE Successfully sell inventions, patented and unpatented. Write for proof, and tell us what you have for sale. Chartered Institute of American Inventors, Dept. 4-C, Washington, D. C.

DIETRICH & Rutley, Registered Patent Lawyers, 512 Colorado Bldg., Washington, D. C.

PATENTS—Personal, confidential services for protection of your invention at reasonable cost. Preliminary information and approximate cost of patent furnished without obligation. John E. Thomas & Co., 902 F St., N. W., Washington, D. C.

"INVENTOR'S Guide," 100 mechanical movements, free; advises on patenting, selling inventions. Frank Ledermann, Tribune Bldg., New York.

PATENTS, Instructions "How to Establish Your Rights" and form, "Evidence of Conception"—sent free! Lancaster, Allwine & Rommel, 411 Bowen Bldg., Washington, D. C.

PATENTS, Booklet free. Highest references. Best results. Promptness assured. Watson E. Coleman, Patent Lawyer, 724 Ninth St., Washington, D. C.

L. F. RANDOLPH, 302-B Victor Bldg., Washington, D. C. Low cost. Book and information free.

INVENTORS—Send for free booklet "Patent-Sense." Information based on 84 years experience. Lacey & Lacey, Dept. 5A, 635 F St., Washington, D. C.

PATENTS—Trade marks. Preliminary advice, book and disclosure form free. Personal service. Irving L. McCathran, 1060 International Bldg., Washington, D. C. Registered Patent Attorney.

PATENTS, Protect your idea by securing free "Proof of Invention" folder. Exceptional personal service. Established 1906. E. E. Vrooman, 871 Woodard Bldg., Washington, D. C.

FOR INVENTORS

PATENTS—Before too heavy an outlay of time or money is made on an invention, a search of the Patent Office records should be made to determine as nearly as possible whether or not the same idea has been patented before. The cost of this search is small, while the value of the facts it uncovers is often considerable. We offer inventors and manufacturers a thorough prompt, confidential search service—plus experienced counsel and assistance in every phase of Patent and Trade-Mark practice. Write for our new free book containing valuable information relating to patent procedure. Clarence A. O'Brien and Hyman Berman, Registered Patent Attorneys, 586 Adams Bldg., Washington, D. C.

LET Us develop and sell your ideas or patents. Development and Research Engineering Service, 209 S. State St., Chicago, Ill.

BUYERS Located saleable patented, unpatented inventions. If will sell, reply immediately. No triflers. Booklet on request. Invention Reporter, 11236 So. Fairfield, Chicago.

INVENTORS! Benefit by our experience, protect your interests, secure financial backing without selling your invention! Receive expert advice on improving your product, patenting it, selling it. Send today for complete information. Inventors Limited, 6556 S. Halsted, Chicago.

INVENTORS—Send for 72-page book on patents. Reasonable terms. Conscientious treatment to inventors. L. F. Randolph, Registered Patent Attorney, 302-E Victor Bldg., Washington, D. C.

MODEL Supplies for the inventor. Send 3c stamp for catalog. Pierce Model Works, Tinley Park, Ill.

INVENTORS: "Making Inventions Pay," our 32-page illustrated book, mailed upon receipt of 3c postage. Crescent Tool Co., Dept. Z, Cincinnati, Ohio.

WORKING Models built. Tools, dies and experimental work. Engineering service. Ask for estimate. Confidential. Esquire Tool and Die Corp., 3115 W. Cameron Ave., Milwaukee, Wis.

SELL Your patent through a small classified ad in Popular Mechanics. Many inventors have found buyers in this way. Ask me for proof—I'll gladly send it to you. F. W. Johnson, Manager Classified Advertising, 200 E. Ontario St., Chicago.

TO Inventors: We are in the market to purchase a good patent, preferably a small item made of metal. Will purchase outright or royalty. Purchasing Agent, 241 Front St., New York, N. Y.

I SELL Patents. Established in 1900. Charles A. Scott, 773PM Garson Ave., Rochester, N. Y.

INVENTOR'S Universal Educator; contains 900 mechanical movements; 50 perpetual motions; instruction on procuring and selling patents and selecting an attorney, etc. Suggests new ideas. Price \$1 postpaid in U.S.A. Address Albert E. Dietrich, 511-B Colorado Bldg., Washington, D. C.

INVENTORS: Send immediately for your copies of our new free books, "Patent Protection" and "Suggestions on Selling an Invention." Sixty-eight pages of interesting facts. They tell how patent laws protect you; kind of sketch or model needed; simple steps to take without cost; how successful inventors have secured financial assistance; show interesting inventions; illustrate important mechanical movements. With books we also send free Evidence of Invention form to help establish date of disclosure. Prompt service, reasonable fees, special deferred payment plan. Strictest secrecy. Thirty-six years experience. Highest references. Write us today. The facts in our books are worth money to the man with a good invention. Address: Victor J. Evans & Co., Registered Patent Attorneys, 900-P Victor Bldg., Washington, D. C.

HAVE You a sound, practical invention for sale, patented or unpatented? If so, write Chartered Institute of American Inventors, Dept. 4-A, Washington, D. C.

INVENTORS: Co-operative service. Low rates. 5748 N. 38th, Milwaukee, Wis.

PATENTS Procured, reasonable fees. Patent office search \$2. We sell inventions. No advance fees. Peldyne Co., Engineering Bldg., Chicago, Ill.

INVENTIONS WANTED

SMALL Inventions wanted by manufacturers. I'll help you sell your invention. Write for free circular. Stanley Hull, E-7829 Euclid Ave., Cleveland, Ohio.

SIMPLE, Practical inventions wanted by manufacturers, patented or unpatented. For information write Chartered Institute of American Inventors, Dept. 4-D, Washington, D. C.

ELECTRICAL Driven devices purchased for cash. Darby, 124 Church, Buffalo, N. Y.

PATENTS FOR SALE

PATENT Hack saw will eliminate all other. Lorusso, 9721 Long Beach Blvd., South Gate, Calif.

REVOLUTIONARY Feather weight copy holder; cast aluminum; rides typewriter carriage; synchronized with platen roller; automatic spacing; detachable for desk stand. Every typist prospective purchaser. Patented. Sale or royalty. J. S. Wheeler, Phoenix National Bank Building, Phoenix, Arizona.

INVENTIONS Made, perfected, for you. Reply 25c. Farris, Valley Junction, Iowa.

MUST Sell patent 2041412. Lighting. P. Hemmighous, 1029 Wenonah Ave., Oak Park, Ill.

INTERNAL Combustion engine, 2 cycle, patent No. 2032985. 4417 Itaska, St. Louis, Mo.

NEW-STYLE, Picture hook patented, royalty. Rubel, 165 E. 27 St., New York.

RADIO Antenna for automobiles. Design patent No. 106,149. For information write to Edw. L. Schiavone, 3410 - 13th St. N. W., Washington, D. C.

MANUFACTURING

ANALYSIS. Research. Newest guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, DS-1142 Sunnyside, Chicago.

FINE Wood turnings guaranteed. W. G. Day, 1039 Hamilton, Indianapolis, Ind.

WANTED—Product to make in wood-working plant, having equipment for handling heavy stock, including wood rolls. Rodney Hunt Machine Co., Orange, Mass.

PRECISION Built parts manufactured in any quantity. Stampings, tools, dies, screw machine work. Repairs and parts made for Hardinge bench lathes and attachments. (25) years experience. Northwest Machine Co., Inc., 4553 Diversey Ave., Chicago.

INVENTIONS Manufactured in any quantity at low cost. Stampings, dies, models, etc. Estimates and free catalog. Crescent Tool Co., Dept. X, Cincinnati, Ohio.

MANUFACTURING. Dies, machinery, models, brasswork, white metal casting moulds. Catalog 3c. Baum's Metal Specialties, Kansas City.

MODELS AND MODEL SUPPLIES

THE Latest catalog—Locomotive, gas, steam engines; castings, model supplies—25c. Refund on order. Howardco, A-2417 N. Ashland, Chicago.

SHIP Model supplies and fittings. Catalog dime. Weicher, Fulton, N. Y.

THREE Model airplane kits, glue, knife, brushes, paint, castings, wood, etc. \$1.30 value, one dollar postpaid. Pastime, 1397 Flatbush, Brooklyn, N. Y.

MODEL Railroads! New! Pacific type (4-6-2) locomotive; easily built, realistic, detailed. Looks like metal. Complete kit, \$1.00 postpaid. J. Berkeley, 1704 Stephen Street, Ridgewood, Brooklyn, N. Y.

COMPLETE Boat model 12" kits. Battleship hood, liner Rex, Queen Mary. 50c each postpaid. Model, 5307-P New Utrecht, Brooklyn, N. Y.

3 1/2" SCALE Steam locomotive easily built by "Step" method. Catalog of castings, instructions, boiler fittings, track material, etc. 25c coin (returned first order.) Little Engines, Box B15, Wilmington, Calif.

ENGINE Catalog 20c. Particulars free. Evraymesco, 28 N. Clinton, Chicago.

MODEL Railroader, monthly magazine that's "exclusively model railroading." Single copy 20c. Lobby Bldg., Wauwatosa, Wis.

HEADQUARTERS For yacht fittings—Marblehead (50-800) and Class A. List free. Illustrated catalog of ship fittings and construction sets 15c. A. J. Fisher, 1002-1 Etowah Ave., Royal Oak, Mich.

MODELS—Your ideas developed into practical working models. 30 years' successful experience; thousands of satisfied customers. Confidential service guaranteed. Bank references. Send 3c postage for 32-page book—"Making Inventions Pay." Crescent Tool Co., Dept. Y, Cincinnati, Ohio.

RAILWAY Models. Catalog handbook 25c. Walther, 247 E. Erie, Milwaukee.

GIFTS For Christmas. Fun for boys assembling model China Clipper airplane. 9" wide. Complete 50c postpaid. Holden Products, 713B Woodward Avenue, Ridgewood, N. Y.

BUILDINGS AND PLANS

BUILD Your own air-conditioning outfit this winter! Make your own "mountain air"—for home, store, office or workshop! Live in new world of year-around health and pep! Parts and materials picked up at small cost. Complete, diagrammed directions, blueprints, make construction simple and easy. Worth full cost, educationally alone—offers good income opportunity. Written money-back guarantee. Send \$1.00 (or pay postman \$1.15). Servatex Company, 871-PM Madison Building, Milwaukee, Wisconsin.

PURPLE Martin birdhouse blueprints. Twelve \$1. Albert Publishers, Des Plaines, Ill.

HOME CRAFTSMEN

WOODTURNINGS, 12 Assorted turnings (small) very useful in making models, radio cabinets, furniture, novelties, games, etc. Sent postpaid on receipt of 35c cash or money order only. F. M. Weber, 508 Marcy Ave., Brooklyn, N. Y.

CHEST Of drawers for your workshop. Size 28"x20". \$5 postpaid. Photo and details on request. P. O. Box 92, West Springfield, Mass.

20 FULL-SIZED Lawn ornament patterns of animals, birds, etc., 25c. Modern Woodcraft, Saginaw, Mich.

LEATHERCRAFTSMEN—Write for free instructions and price list of leather, tools, etc. Sample cards 5c. Wilder & Co., Dept. F. 1038 Crosby St., Chicago, Ill.

PLASTICS—50 Cents brings catalog and 12 pieces Catalin to make useful articles. Panwood Specialties, Dept. A, Scotch Plains, N. J.

JIG And band saw blades. One dozen assorted jig saw blades 30 cents prepaid U. S. Homcraft Supply, Box 101, Aurora, Illinois.

GLASS Blowing: Regular foundryette equipment includes gas blast furnace for glass blowing and metal casting. Kansas City Specialties Company, P. O. 6022, Kansas City, Mo.

LEATHERCRAFT Supplies: Tools, patterns, fancy and plain leathers, instruction books, etc. Ask for catalogue P M 9. Osborn Bros., 223 W. Jackson Blvd., Chicago, Ill.

LEATHER Assortments, 50c samples for postage. Bent, 3117 Leland, Chicago.

LATEST—Make beautiful sand-carved pictures and panels in wood or glass. Ideal Xmas gifts. No skill required. Instructions, stencil composition, ten blue print designs \$1.00. Sand-Craft Service, Oshkosh, Wis.

KNOCKDOWN Furniture for entire home. Lumber, panels, plywood. Send 10c for catalog. Giles Kendall Co., Decatur, Ala.

HANDICRAFT For everyone. Complete catalogue 5c. Handicraft Headquarters, Davenport, Iowa.

DESIGN Your own furniture. Our complete course shows you how. Only \$8.50. Invaluable to home craftsmen. Write for descriptive folder. Klok Institute, 430 Lyon, Grand Rapids, Mich.

EXPERIMENTERS, Inventors, manufacturers. Giant kit of practical and useful parts and supplies. Washers, screws, nuts, brackets, gears, screw machine parts, rivets, bushings, springs, etc. Over 1000 items worth \$7.50. Price \$1.50. Money back guarantee. Manufacturers Supply House, 211 W. Illinois, Chicago.

OLD GOLD, WATCHES, JEWELRY, PRECIOUS STONES

TRADE Watch repairing. Mainsprings 50c. Paul Jewelry Co., LaCrosse, Wis.

LEARN Watchmaking. Instructions free with tools. Wholesale watch-material catalog 5c. Stewart, Chemical Bldg., St. Louis, Mo.

GUARANTEED Rebuilt watches. Pontiac Watch Co., Box 576-P, Pontiac, Mich.

\$1.00 OVERHAULS Watch. Particulars. International, Box 229, Grand Central, New York.

SPECIAL—Simulated carat diamond ring below manufacturer's cost, 15c. Hobby Man, State Street, Jefferson, Iowa.

AUSTRALIA'S Lovely opals. Illustrated catalogue free. Good selection \$5. Norman Seward, Melbourne, Australia.

5000 REBUILT Open face Waltham, Elgin watches. New chromium open face cases. Make big money! 12 size, 7 jewel, \$4.75; 16 size, 17 jewel, \$7.50. Send 3c stamp for free catalog. The New York Jobbers, Dept. M, 74 Bowery, New York, N. Y.

CASH For old gold, teeth, watches, jewelry. Full cash value mailed day shipment received. Satisfaction guaranteed or articles cheerfully returned. Information free, or ship today. Chicago Gold Smelting Co., 300-P Champlain Bldg., Chicago.

GOLD \$35 Ounce. Ship old gold teeth, crowns, jewelry, watches—receive cash by return mail. Satisfaction guaranteed. Free information. Dr. Weisberg's Gold Refining Co., 1593 Hennepin, Minneapolis, Minn.

NEW Brazilian simulated diamond ring 15c. Importer, 510 Hill, Los Angeles.

FOR THE HOME

AUTOMATIC Humidifiers for furnaces. \$14.75 complete. High capacity evaporator. Save fuel. Be comfortable, healthy. Free circular. Airmister Company, Omaha, Nebraska.

GASOLINE Gas machines, crashes rates. Plans \$1. Ideal-Spec, Lakewood, Rhode Island.

VENETIAN Blinds: Save half! Easily made with our instructions. We supply material. Write for literature. Hochalter Venetian Blind Company, Bloomington, Illinois.

TOBACCO

LOOK! Higher quality! Golden yellow smoking or rich ripe chewing, four pounds, guaranteed and postpaid, \$1. Riverside Ranch, Hazel, Ky.

GUARANTEED: Cigarette, pipe or chewing 5 lbs. \$1.00, ten \$1.75. Pay when received. Pipe and box cigars free. Rives Tobacco Co., Paducah, Ky.

FREE Smokes—Tell me your favorite brands of tobacco, cigars, cigarettes. I'll send free samples and show you better smokes for less money. Pete Moberly, Box 1040, Owensboro, Kentucky.

SURVEYING INSTRUMENTS

GUARANTEED Factory rebuilt transits and levels for rent (with purchase option) or sale (cash or terms). Order now before prices advance. We will repair, trade in, or buy your old instruments. Ship prepaid for estimate and valuation. Write for List M-212 and complete information to Warren-Knight Co., 136 N. 12th St., Philadelphia, Penna.

WANTED—MISCELLANEOUS

TREASURE Finders. We buy used mineral locators, late and old models. Write us giving full details, from whom bought, date, etc. Hidden Science Institute, 1046 South Olive Street, Los Angeles, California.

MANUFACTURER'S Attention. We can increase your production. Have national outlet for small articles retailing from 5 to 25 cents. Send samples and prices. Midwest Sales Co., 2727 Michigan, St. Louis, Mo.

CASH For used microscopes, binoculars, slide rules, drawing sets, cameras, surveying, medical and scientific instruments, tools, marine equipment. Highest prices paid day shipment received. Satisfaction guaranteed or shipment promptly returned. Elman's, 2302 Van Buren, Chicago.

PERSONAL

GET Rid of athlete's foot quickly, easily, successfully. Complete instructions \$1. Nature's Remedies, Box 188-A, Station 3, Los Angeles, Calif.

RE-VITALIZE Your hair. Successful health method. Write Healthway, 60 Weldon, Rochester, N. Y.

TRY Amazon Mate! Instead of coffee, tea; refreshing, stimulating, healthful. Write Meyart, Box 1305X, St. Louis, Mo.

YOUR Name in beautiful, sparkling gold. Dime and stamp. T. Kromer, 4124 Madison St., Spokane, Wash.

INFORMATION About California and its business opportunities, \$1.00. State occupation. George Comte, 9421 Wilshire, Beverly Hills, Calif.

SHOOTING High in this game of life? Interested in greater personal power? Write today! Edw. Johnston, 257pm North Washington, Tiffin, Ohio.

"LIX" For athletes' foot. Postpaid 50c. Hamilton Laboratories, Racine, Wis.

WIN Prize money! New booklet—"Successful Contesting"—shows how. 10c postpaid. Bulletin listing \$200,000.00 prizes included free! World Publishers, 4515-B Cottage Grove, Chicago.

WANTED, Original poems, songs, for immediate consideration. Send poems to Columbian Music Publishers, Ltd., Dept. 33, Toronto, Can.

BEAR Oil—Best treatment for baldness. You never saw a bald headed Indian. They use it. We can supply you with the genuine product. One dollar prepaid. Swastika Drug Co., Limited, Swastika, Ontario.

BUNIONS Actually relieved. Treatment \$1.50. Inquiries answered. Eugene Eaton, D108, Bandon, Ore.

STUTTERING And stammering corrected at home. Descriptive booklet free. Paul J. Wolfe, Box 52, Pittsburgh, Penna.

MISCELLANEOUS

ELECTRO Motor propelled chairs. Are you cripple or aged? Our motor chairs "are a God-send." Electro Co., 44 Santa Clara, Long Beach, Calif.

LEARN To tan your own hides and furs. Marvelous new Krome-Tan works like magic. Write today. Or, we will tan your skins, make up rugs and garments. Ask for price list. Established 1903. Northwestern Fur Co., Dept. 3, Omaha, Nebr.

GOLD Specimen \$1. Rocks. Minerals. Swallow, 849 Flora, Winnipeg, Can.

KNOCK-EM-COLD! Learn police Jiu Jitsu! 36 secret knockout blows without fists, many one-fingered, headlock breaks, etc. New complete illustrated course by world-famous instructor, only 15c today. S. J. Jorgensen, Maritime Bldg., Seattle, Wash.

BUSINESS Proposition resilvering mirrors, autographs, reflectors, making chipped glass signs. Write, Sprinkle, Plater, 288, Marion, Ind.

MONUMENTS \$11 Up. Freight paid. Lettered. Guaranteed. Free catalog. Marble-Granite Co., A17, Oneco, Fla.

SAVE 50% To 200% on Christmas decorations, cards and fireworks. Free price list. Leon Bresky, 1610½ Hamilton, Houston, Tex.

SIGNS, Pictures by new methods. Particulars 10c. Straley, 28 Spring, Springfield, Ohio.

LIKE To draw? Earn steady income tracing and duplicating advertising cartoons. Ad-Service, Argyle, Wis.

MEXICAN Jumping beans. Send 25c for samples. Paul Jewelry Co., LaCrosse, Wis.

WATERPROOF Basement walls, floors. Inexpensive. Easy. F. Gerwin, Meeker, Oklahoma.

OK. ROOFING. Make it your self. 1c sq. foot. Particulars 25c. R. Preston, Box 511, Ottawa, Canada.

ED. HARTER'S "Lunch Bar" candies. 24 full size, fresh, delicious, assorted bars of healthful candy. Send postpaid \$1.00. Send today! Ed Harter, Inc., Box 97, Cecil, Ohio.

DANDY Novelty "Start of First Sit-Down Strike," will create lots of laughter. 15c. Wells Enterprises, Box 328, Dept. PM, Aurora, Ill.

MICRO Slide of the eye. First time sold. \$1.00 postpaid. Hampton, 1268 Madison Ave., New York, N. Y.

NEW Note book with flat mechanical book-mark pencil for purse or tuxedo pocket. Ideal gift. \$1.00 postpaid. Literature free. Rivet-O Mfg. Company, Orange, Mass.

KEY Machines—lowest prices. Christison's, 1019 14th St., Denver, Colorado.

67 PENMANSHIP Copies \$1.00. 6 cards and samples 10c. Bert Rich, Wizard of the Pen, Ocala, Florida.

FREE Illustrated catalog. outstanding bargains! Sports equipment, games, stamp accessories, coin boards, etc. C. Otto, 1418-CL Leonard, Evanston, Illinois.

CHRISTMAS Gift pencils. 144 \$2.75. Samples 5c. Ad-Craft, LaCrosse, Wis.

CUTS Anybody can make. Zinc etching process. Specimens, particulars, testimonials for stamp. J. C. Day, Windfall, Ind.

TATTOOING Outfits, supplies, illustrated lists free. Waters, 965 Put-nam, Detroit.

SWAPPER'S Friend. R4, Saline, Mich. Interests swappers, collectors, sportsmen. 50c year, sample 10c.

AMATEUR Tattooing outfits, illustrated catalog 6c. "Tatuco," 651A S. State, Chicago.

COCOONS, Butterflies, collectors' supplies, butterfly art materials. Free lists. Maynard, 1192 Lewiston, Rochester, N. Y.

JUST OUT—A BOOK THAT IS DIFFERENT
The Facts In This Book Will Amaze You
WRITTEN UNDERSTANDINGLY
Tells where to find Diesel employment. Includes every phase of Diesel engineering. Origin and classification of Diesel engines. Passenger, Truck, Aircraft and high speed Diesel engines and many other interesting contents.
DON'T DELAY—Send check or money order. Books mailed promptly. C. O. D. orders \$2.00.
ABC DIESEL PUB. CO. NOW \$1.75 ONLY \$1 Postpaid
Box 55, Walbrook Sta., BALTIMORE, MD.

ART MAGAZINE
The Picture Magazine of a **THOUSAND THRILLS** for those who love the **BODY BEAUTIFUL**. Contains fine Drawings, Photos, Prints of IDEAL HUMAN FIGURES, Cartoons, Comics, Birds, Animals, Scenery, etc. For MEN: Artists, Students, Teachers, Thinkers! lovers of the Body Beautiful, Articles, lessons on Art and Nature, Health, Physical Culture, etc. Can't be described, you must see to appreciate. To introduce the finest Art Magazine ever published we offer 5 **Big BACK ISSUES**, also a large Art Portfolio of FAMOUS STATUARY (this was \$2.50), all now for \$1, prepaid. Interesting! Instructive! Inspiring! Student writes "I would buy my 54 cent one if I could replace." A gold-mine of Art and Inspiration. Name free—You can't lose. **OK or refund. CUT THIS OUT**, send with \$1. NOW, supply limited. Lockwood Art Studio, Dept. 712, Kalamazoo, Mich.

DENISON'S Plays
Musical Comedies, Operettas, Vaudeville Acts, Minstrels, Comedy Songs, Make-up Goods.
Catalog Free
60 YEARS OF HITS
T. S. Denison & Co., 203 N. Wabash, Dept. 9, Chicago

SONG POEMS
our offer. **RICHARD BROS., 62 Woods Bldg., CHICAGO, ILLINOIS**
WANTED AT ONCE! Mother, Home, Love, Patriotic, Sacred, Comic or any subject. Don't delay—send best poem today for

STUDY ENGINEERING AT HOME
BIG STEADY JOBS—BIG PAY for skilled Engineers. Courses prepared by 84 Noted Engineers and Professors. Degrees conferred in Electrical, Mechanical, Diesel, Civil, Automotive, Aeronautical, Radio, Architectural, Drafting and Chemical Engineering. Only standard text-books used. Become a Real Engineer.
McKINLEY COLLEGE OF ENGINEERING, 4246 Clarendon Ave., Chicago

Save Your Feet
Thousands get relief from painful feet and walk freely with **HEEFNER ARCH SUPPORTS**. Write for **FOOT FACTS**. Tells how to aid nature in strengthening weak feet. It's FREE.
HEEFNER ARCH SUPPORT CO. 659 Lewis Bldg., Salem, Va.

NEW LACO Oil Burner SENSATION!
SAVE 25% on FUEL
Patented High Pressure Carburetor works wonders on little fuel.
MORE HEAT
Keeps your home warm as long as it lasts.
SAVES You About \$100
Now, heat your home the modern, clean, easy way—WITH OIL—at a 25% saving in Fuel Cost! Famous LACO's greatest model priced nearly \$100 under others! Burns low-price oil a new, better way! New device makes heavy oil highly combustible—burns ALL—fuel bills often cut one-fourth or more. Simplified—only 1 moving part. Completely automatic—no work—no watching. Almost noiseless. Easy to install. Thoroughly factory-tested, guaranteed. Beautifully finished. Choice of 3 sizes. Over 40,000 pleased LACO users, everywhere.
FREE BOOK! Send to postcard for big free book filled with photos, full details, quotes the very low price.
DEALERS: Many dealers making big money selling LACOs. Get Special Offer. Send NOW.
LACO OIL BURNER CO., 1127 Union Ave., Griswold, Iowa
Complete Line Oil Burners
Low-priced LACO Mineral-Wick model turns cheap oil to gas, burns 98% air, only 4% oil. Ample heat at tremendous saving. Underwriter Approved. WRITE!

AUTO ENGINE SPEED CONTROL GOVERNORS
To control speed of ANY MAKE of auto engine, regardless of load changes, when used as a stationary or portable power plant. Fully guaranteed. (C.O.D.) or no cash down plan. Engine may be controlled at any speed. Fine opportunity for established agencies. Free circulars. Mfgs. Candee-Smith Governors. Dept. FB, 215 North L. A. St., Los Angeles.
FOR FLAT BELT
FOR V BELT
TO CARBURATOR LEVER

WILL YOUR JOB LEAD TO SUCCESS?
IF YOU DON'T CARE, WE CAN'T HELP YOU
BUT if you are OVER 17 YEARS OLD and are as ambitious as you are capable, we've got something for you.
We are selecting active, forward-looking men to train for Good Jobs in TELEVISION, RADIO AND SOUND ENGINEERING. Plenty of DeForest's Trained Men now hold responsible, well-paid jobs.
Television, Radio and Sound Pictures NEED TRAINED MEN
We select the men we train because we recommend them to leading Manufacturers, Distributors, Dealers, Studios, and Factories for GOOD JOBS.
You'll want to know more about this money-making opportunity. Write us today! Giving name, address, age, and present occupation.
● **DeFOREST'S TRAINING, Inc. 1109 Armitage Avenue CHICAGO, ILLINOIS**

This MACHINISTS' Home-Study Course



helps men get ahead

Newly assembled—specially priced—these five recent books give you the practical facts on modern machines, up-to-date methods, you need to advance in machine shop work. Take advantage of the other man's experience as found in books, to solve your problems, increase your efficiency, with the new

Library of MODERN MACHINE SHOP PRACTICE

5 volumes—2000 pages—1600 Illustrations
(A combined home-study course and reference library)

This library of machine shop practice was written for practical men. It gives you the best methods for every kind of machine shop work. It fully explains lathes, drills, and other machine tools and their operation, automatic screw machines, speeds and feeds, gear design and production, punch and die work, metal finishing, etc., etc. Plainly written—completely illustrated—the best kind of help to the machine-shop man who wants to advance himself.

No money down—special price—easy payments.

FREE EXAMINATION COUPON

McGraw-Hill Book Co., 330 W. 42nd St., New York
Send me for ten days' free examination the Library of Modern Machine Shop Practice. If satisfactory I will send you \$1.50 in 10 days and \$3.00 monthly until the price of \$16.50 is paid. If not wanted, I will return the books postpaid. (To insure prompt shipment write plainly and fill in all lines.)

Name
Home Address
City and State
Position
Name of Company PM-12-37

**Be a
Civil
Engineer!**
Learn—Quick
Reference
Way



**It's Paying
Big
Right
NOW**

**Cyclopedia of
Civil
Engineering**
7 great volumes.
2,800 pages.
1,600 illustrations.
New revised edition
by twelve of Amer-
ica's greatest engi-
neers.

Includes: Surveying,
bridges, railroads,
steel structures, mu-
nicipal engineering,
water supply, road
building, etc.

Spanish Grain Flex-
ible Covers Gold
Stamped

**Shipped
Free**
For Examination

**Slide
Rule**
Do
prompt
and we
will include a brand
new, circular slide
rule to carry in coat
pocket. Invaluable in
solving all kinds of
engineering problems.

**Earn
\$3000** with the
help of
these books
a Year—and Up!

"Civil engineers are wanted NOW. Enor-
mous amounts are being spent in all
kinds of public works and not a dime is
spent until the Engineer has prepared
plans. Then he must direct the work.
It's a big job and there are not enough
men to go around. Everywhere you go,
you see road work going on—water and
sewer systems being built—vast projects
of all kinds. Here is your Opportunity
to get the necessary training right at
home. These books are complete and
simply written so anyone can understand
them. Start now on our FREE examina-
tion plan. Mail the coupon without ob-
ligation.

American Technical Society
Dept. C919, Drexel at 58th St., Chicago

American Technical Society
Drexel at 58th St., Dept. C919, Chicago
I want to examine the CIVIL ENGINEER-
ING Cyclopedia for 10 days FREE. I will
gladly pay the few cents express, but I
am to pay nothing for the 7 big volumes
if I return them within 10 days. If I
wish to keep them I will send you \$2
after the 10 days, then \$3 a month un-
til advertising price \$29.80 is paid.
Send latest Edition and Slide Rule.

Name
Address
(Attach letter stating age, occupation,
employer's name and address and that of
at least one business man as reference.)

When writing please mention Popular Mechanics

Give Helpful Books for Xmas!

RADIO-ELECTRICITY Books At Sensationally LOW PRICES

LATEST technical information by nationally
known authorities. New popular size books.
Crystal clear. Profusely illustrated. Most
outstanding book values in America!
HOW TO BUILD Exp. Lab. Work Bench. 20c
EXPERIMENTS with 110-V. Electricity. 25c
MOTOR TRANSFORMER EXPERIMENTS. 25c
RADIO EXPERIMENTAL MANUAL. 30c
ELECTRICAL EXPERIMENT MANUAL. 35c
STARTING AN ELECTRIC REPAIR SHOP. 35c
ELECTRICAL-RADIO DICTIONARY, condensed
electrical education. Explains 870 terms. 217 illus. 48c
ALIGNMENT & ALIGNMENT OF RADIO-ELEC-
TRONIC APPARATUS. Equips you to service your
own or others. 55c
HOW TO LOCATE FAULTS in RADIO-ELECTRONIC
APPARATUS. You need this book. 75c
RADIO SERVICING INSTRUMENTS. Two vols. 100
illus. Circuits, data, operating instructions, etc. Both for. 98c
SHORT COURSE in MATHEMATICS. Two vols. frac-
tions to logarithms, clear, amazingly complete. Both for \$1.05
SHORT COURSE in ELECTRICITY and RADIO. Two
volumes. 332 illus. Newest, most complete. Both for \$1.48
Complete Radio-Electrical Library, all 15 books. \$3.98
For Xmas gift postpaid, only.....



MAILED POSTPAID!
Send cash, check or
stamp. Or, books
mailed C. O. D.
ORDER NOW or send
card for Free Folder
describing full line of
Low Priced Books!

ELECTRONIC PUB. CO., Box 323-A, Lincoln, Nebr.

NEW MODEL DRAW-O-MATIC A BETTER DRAWING BOARD TRANSPARENT TRIANGLES AND STRAIGHT-EDGE. ATTACHED, SELF-ALIGNING, SLIDING PARALLEL BAR



Eliminates old fashioned T square. Thousands
now in use by Draftsmen, Artists, Engineers,
Students, Architects and Designers. BUILT TO
A STANDARD OF QUALITY. Hard composi-
tion board; stays flat. No thumb tacks necessary.
Rubber Feet, no slipping or marring. Plated
metal parts. FOOLPROOF. Bar slides easily and
accurately. A SELF-CONTAINED UNIT EASY TO CARRY. Triangles held on
back. ENABLES ANYONE TO DRAW WITH ACCURACY AND SPEED.
Prices start at \$1.85. THREE HANDY SIZES—12"x18", 16"x20", 20"x25". Light
in weight. A perfect gift. SEND FOR FREE CIRCULAR.
ROLLIN PRODUCTS CO., Dept. PM5, 212 W. Hubbard St., Chicago, Illinois

LEARN MECHANICAL DENTISTRY SEND FOR FREE BOOK



Special Tool Offer—Now!
Don't waste the best years of your life.
Learn this money-making business in a
few months. Day or Evening, and become
independent. Big demand. Highly en-
dorsed—oldest school. Practical train-
ing. Individual instruction. Easy terms.
Employment Service. Write TODAY
for free Catalog P
New York School of
Mechanical Dentistry, 125 W. 31 St., New York

BIG Free BOOK ON CRIME CASES

Fasci-
nating book on Scien-
tifically solved true crime
cases sent absolutely free to those
over 17. Also tells how to get into
Scientific Crime Detection, Home Study.
New opportunities. Travel. Steady Employment.
Experience not necessary. Very easy terms.
SCIENTIFIC CRIME DETECTION INSTITUTE OF AMERICA, INC.
CXBldg J. T. Burdette, Pres. Dept. 207 Huntington, West Virginia.

LETTERING ARTISTS MAKE Big MONEY



**BE A SUCCESS—LEARN SHOW CARD PRO-
FESSION "THE ACME STUDIO WAY"**—Spend
2 full weeks our Big Chicago Studios—finish
training spare time at Home. Hundreds taught
this way now receive Big Pay. Free Employ-
ment service. Positions waiting. Earn while
learning. E Z low terms within reach of all.
**MONEY BACK GUARANTEE—NO RISK—
PROVED PLAN.** Name, address and present
occupation brings FREE ABILITY TEST AND
BOOKLET.

ACME STUDIOS, Dept. PM-12, 24 W. Hubbard St., Chicago, Ill.

HOME STUDY COURSES

Home Study Courses leading to Degrees in Arts and Sciences: Philosophy; Education;
Writing; Psychology; Chemistry; Theology; Law; Agriculture; Business; Accounting;
Sales; Advertising; Public Speaking; Electrical, Civil, Mechanical, Diesel, Architectural,
Aeronautical, Automotive, Drafting, Radio and Chemical Engineering. Standard Text.
McKinley-Roosevelt College of Arts and Sciences, 4228 Clarendon Ave., Chicago

AUTOMOTIVE ENGINEERING



Bachelor of Science Degrees—in Automotive,
Aeronautical, Architectural, Chemical, Electrical,
Industrial and Mechanical engineering! Modern
equipment. All college activities. Low tuition.
Write today for Catalog.

**A NON-PROFIT
COLLEGE**

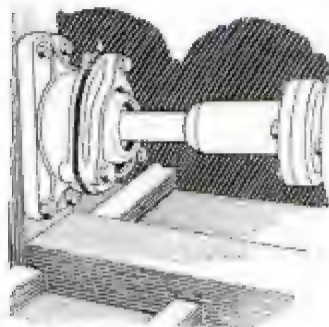
**LAWRENCE INSTITUTE
OF TECHNOLOGY**
15102 Woodward Ave.
DETROIT, MICH.

**CATALOG
ON REQUEST**

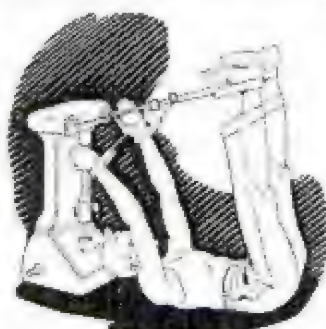
NEW INVENTIONS

(Continued from page 38A)

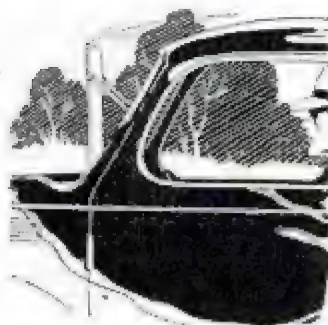
MOTORBOAT owners find freedom from service problems in a new type of stuffing box which gives greater shaft protection, smoother operation and requires no attention. It is said to be flexible, full-floating, self-adjusting and self-lubricating.



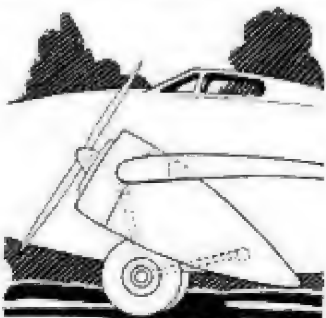
FOR home or public gymnasium use, a newly patented health machine exercises the muscles through vibrational movement of the legs and arms. An electric motor, connected to a swing arm and drive shafts, produces the movements through a harness for the feet and wrists. Exercises are taken while the user lies on his back.



VENTILATION of the automobile may be accomplished in a different manner if a new patent is applied. A windshield which may be opened at the top, instead of the bottom, is the key to the patent. When the windshield is open, and the car is in motion, air is directed above the opening, resulting in an ejector action which withdraws stale air from the interior.



UNUSUAL mounting of the aircraft engine is provided by a patent issued recently. The engine housing, to which the landing gear is rigidly attached, is pivoted. When the landing gear is in use, the engine is tilted at an angle from the horizontal. Once



(Continued to page 70A)

Prepare at Home for JOBS in



With this expert drawing outfit—drafting table, drawing board, superior drawing instruments . . . all sent without additional cost, you are all set to learn **DRAFTING AT HOME**. **FREE TRIAL LESSON** shows how easy. Mail coupon.

THIS DRAWING
OUTFIT
YOURS

DRAFTING

Proof of Jobs in Drafting

T.M.B., Centralia, Washington, says: "Before receiving my diploma, I had made \$1,000.00 in my spare time preparing plans. I am finishing a \$10,000.00 English residence." H.J.K., Rockford, Illinois, writes: "This year I have done \$425,000.00 worth of work, and this year looks better than last." F.J.H., Davenport, Iowa, tells us: "I have just been given complete charge of the drafting room, and have made arrangements to take the Engineers' examination in the State of Iowa."

Jobs for YOU, too

You, like these Chicago Technical College home-study graduates, can prepare for this money-making field . . . where jobs are plentiful . . . advancement quick. All you need do is to send a postal card or the coupon. We will show you how you can

Learn AT HOME

in your spare time (or at the College in Chicago) by the fascinating, easy, step-by-step plan originated by this 34-year old school for Draftsmen.



Free TRIAL LESSON

Sample this easy-lesson system of learning Drafting. Send postal card or this coupon. No charge now or later for this **FREE LESSON**. Prove to yourself how easy it is to learn Drafting by the C. T. C. method in your spare time right in your **OWN HOME**.

CHICAGO TECHNICAL COLLEGE

R208 Tech Bldg., 118 E. 26th Street, Chicago, Illinois

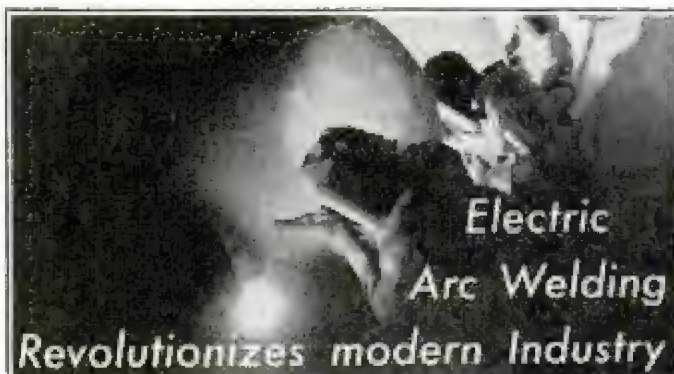
Please send me **FREE Trial Lesson** in **DRAFTING** and show me how I can prepare for good positions in spare time **AT HOME**.

Name.....Age.....

Address.....

P. O.....State.....

When writing please mention Popular Mechanics



**Electric
Arc Welding
Revolutionizes modern Industry**

U.S. Manufacturers desire men to learn Electric Arc Welding and get practical experience under actual production conditions in the laboratories of the School of Engineering. Moderate training Fee. Accepted applicants will be fully trained until ready to pass rigid test and assisted in securing employment. presents one of the outstanding opportunities for steady income and future success. Welding is growing rapidly, replacing large and intricate castings, rivets, nuts, bolts, screws. It is commonly used in assembling cranes, hoists, bridges, structural steel work, etc. No limit to the application of welding to industry, increasing durability and reducing manufacturing costs. There is a decided shortage of properly trained Welding Operators, Technicians, and Welding Engineers. Why be content with ordinary work, hit and miss jobs and low pay when in a short time you can become a trained Specialist in Welding?

**MILWAUKEE
SCHOOL of ENGINEERING**
Institute of Electrotechnics

Dept. PM-12-A, Broadway & E. State, Milwaukee, Wis.

Without obligation read Free Booklet "The Dawn of a Gigantic Industry and its Outstanding Opportunity." Also tell me How to Become an
Arc Welding Operator (3 mo.)..... Air Conditioning & Refrig. Tech. (3 mo.)
Gas Welding Operator (6 mo.)..... Radio Serviceman (6 mo.).....
Welding Technician (6 mo.)..... Commercial Electrical Engineer (1 yr.)
Welding Engineer (1 yr.)..... Commercial Radio Engineer (1 yr.)
Electrical Engineer..... Student Loan Plan.....
U.S. Degree (4 yrs.)..... Earn Part Expense Plan.....

Name..... Age.....
City..... State..... (PM-12-A)



**STEP INTO
THE Spotlight**

FREE LESSONS... A YEAR TO PAY

**Banish Boredom... Earn Extra Money
START TO PLAY VERY FIRST DAY**

Picture the joy of playing a snappy foxtrot, dreamy waltz or mellow old favorite on the Xylorimba. No reason why you shouldn't! Xylorimba is **easiest** of instruments to play and yet the most spectacular. In constant demand by orchestras, radio stations, at lodge meetings and parties. Marvelous opportunity to increase popularity, make big spare-time money. No bothersome practice or exercises. With Free easy lessons you actually **Start to Play Very First Day.**

BIG FREE BOOK tells all about Deagan line, liberal trial offer and easy payments. Send coupon today for your free copy.

J. C. Deagan, Inc., Dept. 1459, 1770 Berceau Ave., Chicago

Send me, without obligation, full details of Free Trial offer and easy-payment plan on the Deagan Xylorimba.

Name.....


Address.....



Wanted! Young Men

**to become experts in the interesting
profession of caring for shade trees**

Rapid expansion of the world's largest tree servicing organization is creating openings for permanent positions and opportunities for advancement on merit to men who qualify. Selections now being made. Only sturdy, clean-cut Americans, not afraid of strenuous work need apply. Must be single, between 18 and 26 years of age, free to travel, with good practical education. Must furnish references and pass a rigid physical examination. Write for qualification blank to serve in place of personal interview. Davey Tree Expert Company, 1237 City Bank Building, Kent, Ohio.

Minstrels Comedy Skits
Unique First Parts for complete show with special songs and choruses. Make-up. Catalog Free.
T. S. Donnan & Co., 203 N. Wabash, Dept. 19, Chicago



Midget Portable ELECTRIC OR BATTERY
World's Smallest Radios
Just a handful—WE only 3 lbs. Size 3 1/2" x 4 1/2" x 1 1/2" performance! Midget BUILT IN LOUD-
SPEAKER and AERIAL—Requires no ground—Hi-
efficiency circuit and quality parts. Has Broadcast, Short
Wave and Foreign bands. Simple to operate—durable—
troubleless. Ideal Radio for office, auto, bedroom, college, camp,
travels, tourists, etc. Battery model has battery inside case for use on
lamps, lamps, auto, etc. Electric model uses 2 D-cells A.C.B.C. Later
model—kit of parts for \$6.49—Wire and checked 300 watts of 20.00.
complete ready to listen beautiful transparent cabinets. State Color.
Send only \$1. and post postage today on delivery. (Batteries for
Battery Model \$1.25 extra). Free catalogue listing 100 other radios at
factory prices. **QUICK SHIP OF GANTER.**
TINYTONE RADIO CORPORATION, Dept. P-12, Kearney, Nebr.



THIS VALUABLE BOOK

FREE

WIN \$25.00

Everyone who likes to draw should have this FREE book. Contains money-making tips, cartooning charts, idea creating methods, list of cartoon buyers and other valuable information. Sent free with details of big prize contest in which you may win \$25.00 for drawing a simple cartoon. Also complete particulars on the new Marionette Method of Cartooning. Send no money. Everything offered here is FREE. Rush name at once.

CARTOONISTS' EXCHANGE
Dept. 910 Pleasant Hill, Ohio



Easy

What a thrill when you play your first tune the very first week on a P-A Sax'. Then popularity... admiring friends, good times, a glorious future. Try a new model P-A Sax', Trumpet, Trombone, Clarinet at your local music store, or write for beautifully illustrated book. Finest instruments at amazingly low prices. Easy terms. Write today sure. 1245

FREE PAN-AMERICAN BAND INST. & CASE CO. BOOK 1263 P-A Building, ELKHART, INDIANA

HOTEL TRAINING

—For Better Positions... Substantial Salaries—Classes Now Forming

Increasing opportunities for trained men and women in fascinating, nationwide hotel field. Qualify thru short, specialized, intensive courses in America's only exclusive hotel training institute. Come to Washington. Learn in four months on real hotel equipment. Study under expert instructors in \$200,000 specially designed institute. Enjoy the attractions of Washington while training. Day classes start Jan., Feb., Sept., Oct. National Placement Service FREE of extra charge.



Hundreds of graduates "making good" in Hotels, Resorts, Clubs, Apartment Hotels, Schools, Restaurants, Hospitals everywhere. Free Catalog gives full details—write for it now.

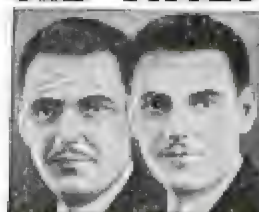
LEWIS HOTEL TRAINING SCHOOLS
Division RFW-340 Washington, D. C.

ARTISTS MAKE MONEY

Find out your ability. Send name, age, occupation and address for Free Vocational Art Test.

Federal Schools, Inc., 12137 Federal Schools Bldg., Minneapolis, Minn.

OLD FACES MADE YOUNG



MEN you can look 10 to 15 years younger. **5 Minutes a Day Keeps Wrinkles Away** and erases age lines. This new sensational home method **Sent on Trial—You Risk Nothing.** Lifts sagging muscles, fills up hollows. **No Cosmetics.**

Men, Women, all ages write for thrilling book and **Facial Analysis Chart**—both sent **FREE** in plain wrapper.

PAULINE PALMER, 1461-C Armour Blvd., Kansas City, Mo.



CARTOONING

Develop your talent quickly with the New Picture-Way method and prepare yourself for a professional career. 27 Large Easy Lessons. New "Flexi-Joint" Figure included absolutely **FREE!** Sent postpaid, \$1.00 Complete. Guaranteed!

Stewart Cartoon School, Dept. P-12, 3555 Aberdeen, Alton, Ill.

Own A Profitable Greaseless DOUGHNUT BAKESHOP Start In Your Kitchen!

Who else wants to enjoy profits from this amazing new business you can start in your own kitchen? New electrical invention turns out delicious, different Brown Bobby Doughnuts. Everybody wants them! Stores eager to sell for you. Profits up to \$16.25 in a day possible selling production of one machine at wholesale only. We supply equipment and tested money making plans. This is your chance. Send No Money. Rush postcard for FREE details.

BROWN BOBBY CO.,
325 W. Huron St., Dept. B-1812, Chicago, Ill.



AMAZINGLY NEW MIDLAND'S GREAT "COLOR-CODED"



G. L. "JERRY" TAYLOR
President



NORM SOUTHER
Vice-President

RADIO TELEVISION EXTENSION TRAINING

Developed by experienced engineers and educators. Backed by the resources of nationally known, 5000 watt, Columbia network basic broadcasting station KMBC. "Color-Coded" training fits you for better radio jobs... prepares for future television opportunities. You will get 90 simply worded, modern, "color-coded" lessons; 10 attractive "home laboratory" manuals; 10 big shipments of experimental equipment including a three inch cathode ray tube... sufficient to conduct 108 working experiments. And it will be yours to keep. When your home training is completed, you get a bus ticket to Kansas City and 4 weeks intensive training in our fine school laboratories. Graduates qualified to take Government, operator's license exams. Life-long employment service. Investigate this marvelous training plan without delay. (We are not connected with any other radio or television school.)

HERE ARE TWO OF THE MANY EXPERIMENTAL UNITS YOU ARE TO CONSTRUCT AT HOME

We send you all necessary equipment and tools.



Above: A real Oscilloscope with action to startle your friends. Below: Modern 6-tube "Superhet" you will build and keep.

IT'S FREE!

Get the Facts without delay — send for this handsome book TODAY!



☐ **MIDLAND TELEVISION, Inc.** (Mail in envelope or paste on postcard)
☐ 29th Floor, Kansas City Power & Light Bldg.
☐ 106-M W, 14th St., Kansas City, Mo.
☐ Without obligating me, send your new FREE book about the Radio-Television profession, "FORTUNES in FORESIGHT."
☐ Name.....Age.....
☐ Address.....
☐ City.....State.....

Two Giant Industries NEED MEN NOW!

AIR CONDITIONING ELECTRIC REFRIGERATION

We supply trained men for America's two fastest-growing industries. If you can meet our requirements, we will train you in spare time at home for a good pay position as an Installation and Service Expert in the Electric Refrigeration and Air Conditioning fields. In addition we will give you **ACTUAL Shop Practice** when you graduate, and help you to qualify for profitable employment with an exceptionally bright future.

Can You Qualify?

To be acceptable for enrollment you should be mechanically inclined, between ages of 18 and 40, have fair education and be able to furnish character references.

GET FREE BOOK

Get amazing facts about actual opportunities for ambitious men in Air Conditioning and Electric Refrigeration. Our new Free Book describes these money-making opportunities and tells about our low-cost, easy-pay plan of training. Send coupon below, or write for your copy today stating age and which industry interests you most. No obligation.

UTILITIES ENGINEERING INSTITUTE (Established 1927)
400-410 N. Wells St. Dept. 1127 Chicago, Ill.

SEND THIS COUPON FOR FREE BOOK

Utilities Engineering Institute, Dept. 1127,
400-410 N. Wells St., Chicago, Ill.

Please send me your Free Book telling how I can qualify for the big opportunities offered in Air Conditioning and Electric Refrigeration. I have marked which interests me most.

☐ AIR CONDITIONING

☐ ELECTRIC REFRIGERATION

NAME.....

ADDRESS.....

CITY.....STATE.....



Learn to MOUNT Birds and Animals

**FUN-FASCINATION
PROFITS — IN SPARE TIME**

Learn **TAXIDERMY** at home **BY MAIL**. Save your hunting trophies, decorate your home and den, have a grand **HOBBY**. This old reliable school (with 250,000 students) will teach you at home to mount **BIRDS, ANIMALS, FISH, GAME-HEADS**—and to **TAN** hides and furs by wonderful **KROMETAN** system, also **NOVELTY TAXIDERMY**, using common specimens—no wild game needed.

FREE BOOK 100 beautiful pictures. Tell how **YOU** can learn **Taxidermy** easily, quickly, at home. Tells how to **EARN FINE PROFITS** in spare time. Rush letter or postal for this strange marvelous **FREE BOOK**. Write **NOW—TODAY**. State **AGE**.

N. W. School of Taxidermy • 3379 Elwood Bldg. • Omaha, Neb.

WHAT COLOR TO USE? THIS BOOK TELLS YOU QUICKLY!

If you are interested in Interior Decorating, House Painting, Show Card Writing, Window Trimming, Designing, or Advertising you need **PRACTICAL COLOR MANAGEMENT**, the big new book that eliminates color puzzling. Frederick M. Crowlson tells you and also illustrates how to employ color profitably and correctly.

Get your copy **NOW**! Costs only \$1.50 prepaid—Money back if not satisfied—Free descriptive catalog of many other practical books sent to you on request.

FREDERICK J. DRAKE CO.

Dept. D-1—177 North Michigan Avenue,

Chicago, Ill.

WOODSTOCK TYPEWRITERS

LAW **STUDY AT HOME** for Personal Success and Larger Earnings. 28 years of successful student guidance assures expert instruction. L.L.B. Degree awarded. All text material furnished. Easy payment plan. Send for **FREE BOOK**—"Law and Executive Guidance," at **ONCE**.

AMERICAN EXTENSION SCHOOL OF LAW
Dept. L-1, 737 N. Michigan Ave., Chicago, Ill.

SUCCESS

CAN BE YOURS—LEARN DIESEL
at **JOURDEN SCHOOLS** in
Philadelphia, Pittsburgh, Baltimore or Cincinnati

WRITE TODAY for your copy of our Free illustrated booklet—"WHY DIESEL MEANS DOLLARS TO YOU". Learn about the Big Opportunities for trained men. See how Jourden courses are helping men to success in the Diesel field. They will help you, too. **WRITE TODAY!**

JOURDEN DIESEL SCHOOLS
2837A N. Broad St., Philadelphia, Pa.



SIGNS AND SHOW CARDS

LEARN AT HOME IN YOUR SPARE TIME IN 3 WEEKS. 27 Big Easy Picture-Way Lessons teach you popular easy pen and brush lettering, color, layout, air brush, silk screen, how to start in business, trade secrets, etc. Thoroughly illustrated. Size 9x12 in. Complete with all alphabet charts. Written by D. Rogers Stewart, noted Artist-Instructor. Money Back Guaranteed! "Nothing more to pay."

STEWART SIGN SCHOOL, Dept. P-12, 3555 Aberdeen, Aiken, Ill.



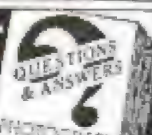
PLAY A SAW!

Produce wonderful music in 5 days ...quickly play popular and classical numbers. No notes to read, no dreary practice—success guaranteed. Since 1924 thousands of my students have amazed friends, starred in shows and broadcasting orchestras. Without obligation, write for 5 DAY TRIAL OFFER now.

MUSSEHL & WESTPHAL
123 W. Water St., Fort Atkinson, Wis.

Do You Want To Be An Ace Photographer

SEND TODAY for Questions and Answers in Photography. One of the most **HELPFUL** books ever issued. Answers every question—clearly, simply. Information to put you in the big money class. Send \$1 for copy on 10-Day Approval, postage prepaid. Carleton Co., Publishers, 16 E. Huron, Chicago.



BUILD CLOCKS
for
PLEASURE—PROFIT



Hall clocks are high priced in stores—you can make good money building them or electrifying spring clocks. Dime brings drawing of easily built Grandfather Case with "HOW" Book pricing lamp, desk, mantel, spring. **ELECTRIC chime. BATTERY CLOCKS** from \$1.40. **Hall Clock. Brass weight chime movements** from \$15.85. **Starters. KUEMPEL CHIME CLOCK CO.**
Building 11 Guttentberg, Iowa



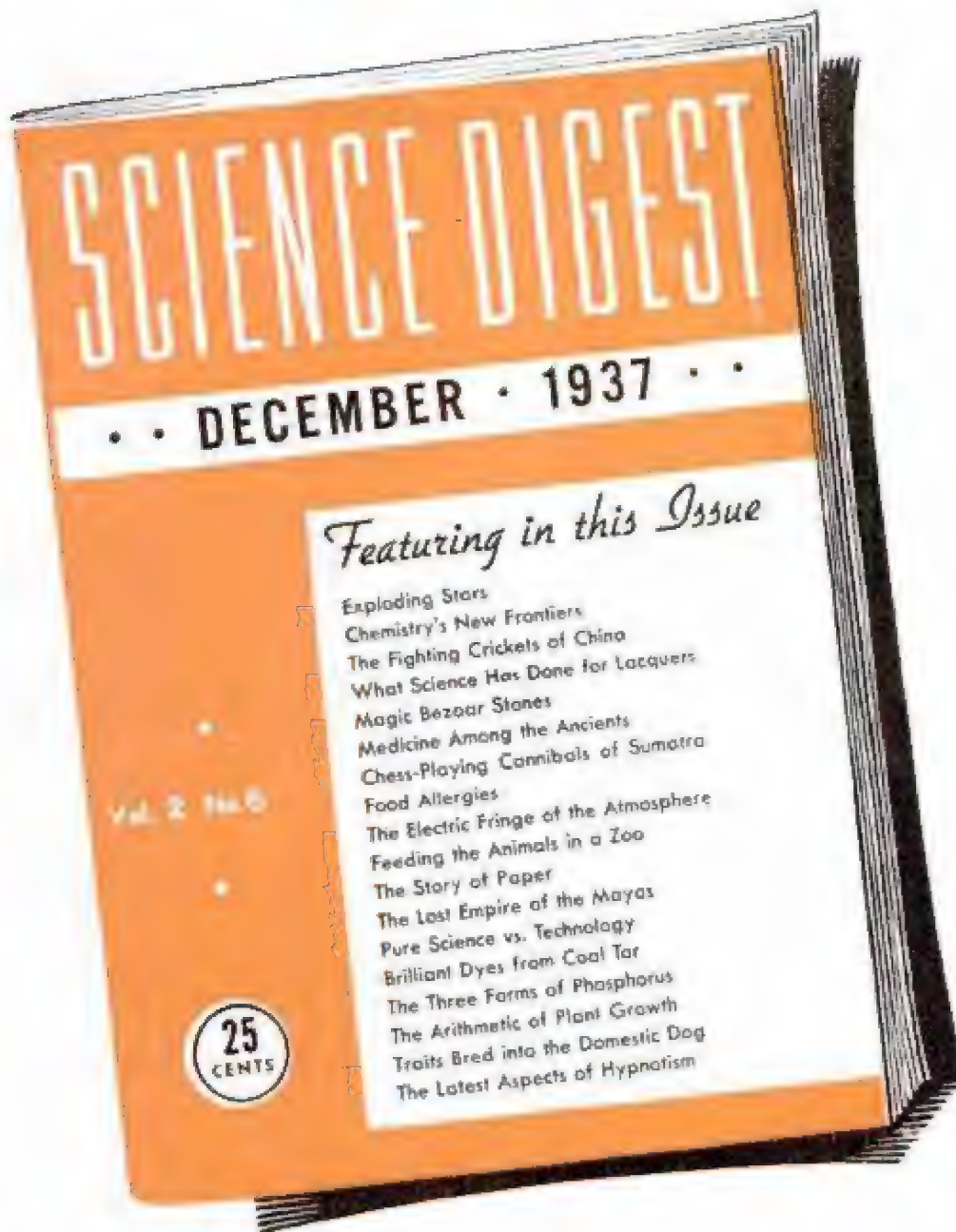
Earn Cash at Home!

Raise giant **Patented Mushrooms**! We supply materials, instruct with pictures, & our 25 branches buy all crops. Big **FREE** book, photos, tell if your cellar, shed, barn, etc., suitable. Write today. Ed. 1308, **UNITED CO., 3848 Lincoln Ave., Dept. 304, CHICAGO**

When writing please mention *Popular Mechanics*

RECENT NUMBER SENT

FREE



To anyone anywhere, we will send, free, a recent copy of Science Digest. We believe that, having read one issue, you will buy this December copy—and others to come—at a newsstand, or will mail us your subscription at once. You'll find foreign and domestic subscription rates in the sample copy you receive.

The contents of this December number—on newsstands during November—show you how Science Digest covers all branches of science, and it does so concisely, clearly, interestingly. Science Digest is so authoritative that it is subscribed to by many scientists and is used as a supplementary textbook in many science classes. It is so informative and interesting that it is read by business men, professional men, salesmen, skilled artisans, housewives.

If you have been hesitating about laying down

a quarter at a newsstand and seeing what Science Digest is like, you need not wonder any longer. Just mail this coupon today.

Incidentally, after you've read a copy, you may wish to give Science Digest as a Christmas gift, as well as become a regular reader yourself.

Science Digest, Inc.
633 St. Clair Street, Chicago, Illinois.

Gentlemen: Will you please send me, free, a recent number of Science Digest.

Name

Occupation

Street

City.....State.....

When writing to advertisers please mention Popular Mechanics

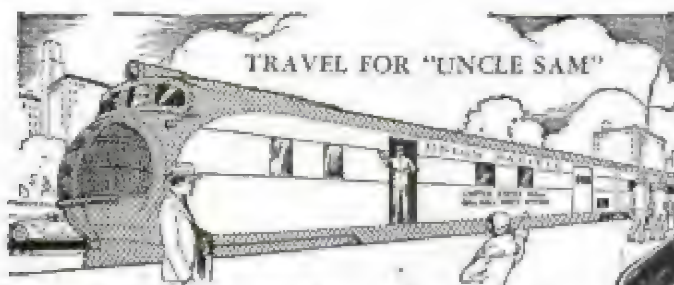


**START
\$1260 to \$2100 YEAR**

**MANY 1938
APPOINTMENTS EXPECTED**

Railway Postal Clerks

Railway Postal Clerks get \$1,000 the first year regular, being paid on the first and fifteenth of each month. (\$79.17 each pay day.) Their pay is automatically increased yearly to \$2,450. Advance may be had to Chief Clerk at \$2,700 a year. (\$112.50 each pay day.)



3 Days On—3 Days Off—Full Pay

Railway Postal Clerks on long runs usually work 3 days and have 3 days off duty or in the same proportion. During this off duty their pay continues just as though they were working. They travel on a pass when on business. When they grow old, they are retired with a pension.

City Mail Carriers, Post Office Clerks

Clerks and Carriers now get \$1,700 the first year on regular and automatically increase \$100 a year to \$2,100 and \$2,300.



Customs Inspector

Salary \$2,100 to start. Men 23 to 45. Work connected with examining baggage and merchandise entering the country from foreign parts covering boats, trains, roads, automobiles, etc.

Many Other Positions

Many other positions are obtainable. Those wishing these positions should qualify at once.

Get Free List of Positions

Fill out the following coupon. Tear it off and mail it today—now, at once.

This investment may result in your getting a big-paid government job.

FRANKLIN INSTITUTE, Dept. K-196, Rochester, N. Y.

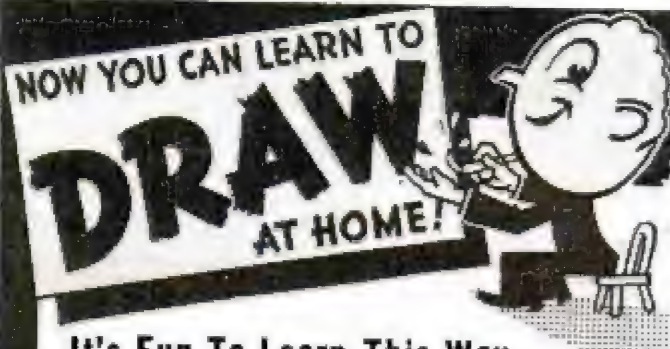
Rush to me, entirely free of charge (1) a full description of U. S. Government Jobs; (2) Free copy of illustrated 32-page book, "U. S. Government Positions and How to Get Them"; (3) List of U. S. Government Jobs; (4) Tell me what to do to qualify for a U. S. Government Job.

Name.....

Address.....

Use This Coupon Before You Mislay It. Write or Print Plainly.

When writing please mention Popular Mechanics



**It's Fun To Learn This Way
—At Home—In Your Spare Time**

You know that drawing will give you pleasure and recreation after your day's work is done. We offer you a training in **COMMERCIAL ART, ILLUSTRATING and CARTOONING**, all in one practical course.

Art Offers You Pleasure and Profit

If you are fond of drawing, our course of training will help improve your drawing ability. Later, with continued drawing practice, you may qualify yourself for a pleasurable and profitable career in this field. Our free book, "Art for Pleasure and Profit," gives full particulars of our course and the opportunities in this field. Address your request for this book to

WASHINGTON SCHOOL OF ART

EST.
1914

STUDIO 1212A

1115-15th St., N. W. WASHINGTON, D. C.

Government Jobs

EXAMINATIONS SOON INFORMATION FREE
COLUMBIAN CORRESPONDENCE COLLEGE, WASHINGTON, D. C.



Auto-Diesel

Master a real trade. Auto Mechanics, Diesel Mechanics, Arc Welding, Acetylene Welding, etc. Let us train you to be an expert Auto-Diesel Mechanic and help you get a good job. The cost to you is reasonable. Learn on modern equipment with tools under experienced instructors. Real shop work. Steam heated building. Room and board in our steam heated dormitory. We pay your fare to Nashville. For free catalog write

Nashville Auto-Diesel School, Dept. 75, Nashville, Tenn.

Sell this MARVELOUS Tool

NO EXPERIENCE
NEEDS! CALL
ON ENGINEERS,
CRAFTSMEN,
MECHANICS,
SHEET METAL
WORKERS,
GARAGE
MEN,
ETC.

**Famous Justrite COMBINATION
SOLDERING IRON AND
BLOW TORCH**

Works Like Magic!

Actually astounding—newly perfected, famous Justrite Combination Soldering Iron and Blow Torch gives super, sizzling-hot blue-white flame for soldering, light-brazing and general shop, laboratory, engineering and repair work. Operates with 100% satisfaction on less than 1/2 cent per hour—fully guaranteed by reliable 31-year old company.

Sells Like Wildfire—on demonstration! Start a good, clean, growing business of your own—calling on mechanics, engineers, plumbers, garage men, battery experts, radio men, home craftsmen, painters, sheet metal workers, etc. Make up to \$6 to \$8 per day—full or part time.

FREE: Sensational New "Distributor's Success Plan," to Distributors of this amazing Justrite Combination Soldering Iron and Blow Torch. Don't wait. Write for Complete Information TODAY!

Justrite Mfg. Co., Dept. 153,
2061-41 Southport Ave. Chicago, Ill.



Mount Birds

ANIMALS—FISH—TAN HIDES!

Here's FUN and PROFIT—you start mounting *first day!* Fully illustrated, simple, COMPLETE COURSE covers every branch of Taxidermy. Thousands have easily mastered Taxidermy. You can, too! Learn modern methods.

**COMPLETE 62 Easy Lessons, with 89 pictures
7 Great Books, cover 214 subjects**



DIPLOMA TOO!

FOR ALL

SEND NO MONEY--HURRY! Just pay postman \$1 plus send only \$1 now and we pay postage! **MONEY BACK** if not 100% satisfied. You'll be amazed at this amazing bargain. Be quick—send today!

Schmidt School of Taxidermy Dept. 1208 Memphis, Tenn.

PRACTICAL ENGINEERING IN ONE YEAR

Choose Air Conditioning & Refrigeration; Radio-Television; Electric Arc Welding or Commercial Electrical Engineering and be prepared for success in the industrial world.

ELECTRICAL ENGINEERING IN 3 ADDITIONAL YEARS


By our special system you may **EARN WHILE YOU LEARN**. Free employment service. Student loans. Pioneers for 34 years. Write for illustrated catalog—mention course desired.

MILWAUKEE SCHOOL OF ENGINEERING

B. S. Degree 1020-M North Broadway Milwaukee, Wis.

This amazing "WHERE AND HOW TO SELL honest book shares with **YOUR DRAWINGS**" you all the secrets of a busy, practical commercial artist. **YOUR** sketches and cartoons can be sold, too! This book tells you **WHERE, HOW, AND FOR HOW MUCH!** With the book: 632 selected **ART MARKETS** waiting for your drawings and cartoons (with names and addresses!) Price \$1.00 postpaid.

FREE ARTISTS' COUNSELLORS, 126 Lexington Ave., New York City




CARTOONING

TAUGHT BY MAIL

Personal instruction in this fascinating and well-paid profession by one of America's foremost cartoonists. Write for details.

Dorman H. Smith, 597 C. San Rafael, Calif.




Now BOAT BUILDING MADE EASY

Famous Boat Book Shows How

Detailed instructions, plans, materials, methods for building 15 most popular power, sail and row boats. Get Popular Mechanics BOAT BOOK and build your own at low cost. Prepared for those with limited skill and few tools. Includes plans "What a boat that looks like should know." Only \$3.00. Pay postman on delivery or write for descriptive circular.

Popular Mechanics Press Room 2237D 200 E. Ontario St. Chicago

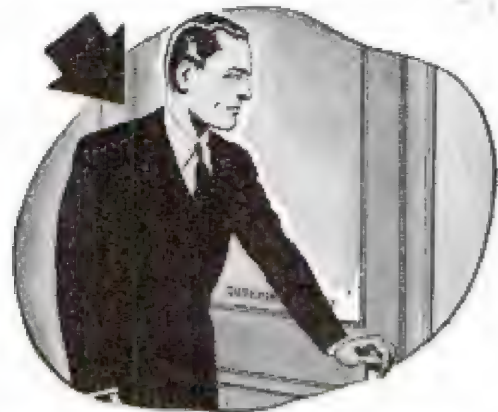


WELDERS WANTED!

ELECTRIC ARC—OXY-ACETYLENE

Skilled Welders earn \$8 to \$15 a day. The demand now greater than the supply. Learn this highly paid trade in 4 weeks by actual shop work. One of America's leading schools. Established 1902. 7 floors of shops. Endorsed by welding industry. Limited number of students. 4 weeks course in Electric Arc or Acetylene Welding. Including room and board, only \$159. Write or wire for reservation. Ask for "Welding Facts." State age.

GREER COLLEGE, Dept. 1127, 2025 S. Wabash Ave., Chicago



GO AHEAD, ASK YOUR BOSS WHAT HE THINKS OF YOU!

● TELL HIM you really want to know, from his point of view, what he thinks about your work. How are you doing now and what are your chances for the future? Can he offer any suggestions for the improvement of your work? ● Go ahead, ask him! If he refers to your lack of qualifications for a more important job, what he means is your lack of training. Well, you can acquire this training in your spare time! All over this country men are getting this training *right now*, by mastering International Correspondence Schools Courses. They realize what training means—and are getting it! Their first step toward better things was mailing this coupon to Scranton.

INTERNATIONAL CORRESPONDENCE SCHOOLS

Box 5694-H, Scranton, Penna.

Without obligation, please send full particulars about the subject before which I have marked X:

TECHNICAL AND INDUSTRIAL COURSES

- | | |
|--|---|
| <input type="checkbox"/> Architect | <input type="checkbox"/> Diesel Engines |
| <input type="checkbox"/> Architectural Draftsman | <input type="checkbox"/> Aviation Eng. <input type="checkbox"/> Auto Mechanic |
| <input type="checkbox"/> Building Estimating | <input type="checkbox"/> Plumbing <input type="checkbox"/> Heating |
| <input type="checkbox"/> Contractor and Builder | <input type="checkbox"/> Air Conditioning <input type="checkbox"/> Refrigeration |
| <input type="checkbox"/> Structural Draftsman | <input type="checkbox"/> Steam Engineer |
| <input type="checkbox"/> Structural Engineer | <input type="checkbox"/> Steam Electric Engineer |
| <input type="checkbox"/> Electrical Engineer | <input type="checkbox"/> Marine Engineer |
| <input type="checkbox"/> Electric Lighting | <input type="checkbox"/> Civil Engineer <input type="checkbox"/> Highway Engineer |
| <input type="checkbox"/> Welding, Electric and Gas | <input type="checkbox"/> Bridge Engineer |
| <input type="checkbox"/> Reading Shop Blueprints | <input type="checkbox"/> Bridge and Building Foreman |
| <input type="checkbox"/> Telegraph Engineer | <input type="checkbox"/> Surveying and Mapping |
| <input type="checkbox"/> Telephone Work <input type="checkbox"/> Radio | <input type="checkbox"/> R. R. Locomotives <input type="checkbox"/> Air Brakes |
| <input type="checkbox"/> Mechanical Engineer | <input type="checkbox"/> R. R. Section Foreman |
| <input type="checkbox"/> Mechanical Draftsman | <input type="checkbox"/> R. R. Signalmen |
| <input type="checkbox"/> Machinist <input type="checkbox"/> Toolmaker | <input type="checkbox"/> Chemistry <input type="checkbox"/> Pharmacy |
| <input type="checkbox"/> Patternmaker | <input type="checkbox"/> Coal Mining |
| <input type="checkbox"/> Foundry Practice | <input type="checkbox"/> Navigation |
| <input type="checkbox"/> Sheet Metal Worker | <input type="checkbox"/> Cotton Manufacturing |
| <input type="checkbox"/> Rollmaker | <input type="checkbox"/> Woolen Manufacturing |
| <input type="checkbox"/> Heat Treatment of Metals | <input type="checkbox"/> Agriculture <input type="checkbox"/> Fruit Growing |
| <input type="checkbox"/> Management of Inventories | <input type="checkbox"/> Poultry Farming |

BUSINESS TRAINING COURSES

- | | |
|--|--|
| <input type="checkbox"/> Business Management | <input type="checkbox"/> Lettering Show Cards <input type="checkbox"/> Signs |
| <input type="checkbox"/> Industrial Management | <input type="checkbox"/> Stenography and Typing |
| <input type="checkbox"/> Traffic Management | <input type="checkbox"/> Civil Service <input type="checkbox"/> Mail Carrier |
| <input type="checkbox"/> C.P. Accountancy | <input type="checkbox"/> Railway Mail Clerk |
| <input type="checkbox"/> Bookkeeping | <input type="checkbox"/> Grade School Subjects |
| <input type="checkbox"/> Secretarial Work | <input type="checkbox"/> High School Subjects |
| <input type="checkbox"/> Cost Accountant | <input type="checkbox"/> College Preparatory |
| <input type="checkbox"/> Salesmanship <input type="checkbox"/> Advertising | <input type="checkbox"/> First Year College Subjects |
| <input type="checkbox"/> Service Station Salesmanship | <input type="checkbox"/> Illustrating <input type="checkbox"/> Spanish |
| <input type="checkbox"/> Business Correspondence | <input type="checkbox"/> Cartooning <input type="checkbox"/> French |

DOMESTIC SCIENCE COURSES

- | | |
|---|--|
| <input type="checkbox"/> Professional Dressmaking and Designing | <input type="checkbox"/> Millinery |
| <input type="checkbox"/> Home Dressmaking | <input type="checkbox"/> Foods and Cookery |
| <input type="checkbox"/> Advanced Dressmaking | <input type="checkbox"/> Tea Room and Cafeteria Management, Catering |

Name.....

Address.....

City..... State.....

Present Position.....

If you reside in Canada, send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada

When writing to advertiser's please mention Popular Mechanics

NEW INVENTIONS

(Continued from page 63A)

the craft is in the air, the landing gear is retracted by swinging the engine back to horizontal position. Thus the weight of the landing gear partially balances the weight of the engine, facilitating operation.

HANDY for the family taking the baby on trips is the combination luggage case and collapsible chair. During the journey, the chair is neatly folded in the case. Upon reaching destination, the chair is unfolded to form a chair for the baby. It is complete to the board which prevents baby from falling out. Set upon an ordinary chair, it serves the purposes of a high chair.

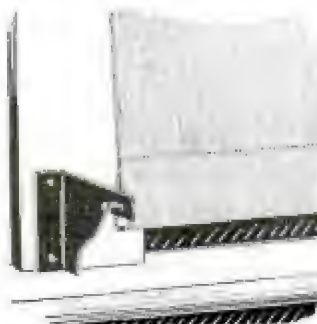


YOUNGSTERS would welcome a toy glider gun just patented. It consists of a small glider which is propelled into the air by means of a rubber band released by trigger. So swiftly is the glider shot forward that its momentum carries it soaring on a

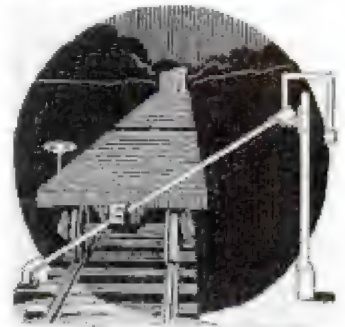


flight quite satisfactory to the young owner. The gun is cocked by pulling the glider back into position, stretching the rubber.

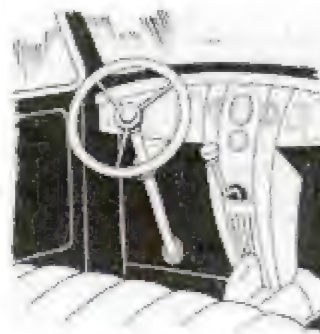
USE could be found for a new window-shade holder in almost any home or office. The holder, intended to keep the shade in lowered position until it is released, is a simple device. It consists of a metal strip for attaching to the wall with a hook located at right angles to the plane of the shade. A nail in the end of the wooden strip at the lower edge of the shade slips under the hook, holding down the shade.



AUTOMATIC detection of the passage of railway cars is provided by a new photoelectric-cell device. A light source on one side of the track projects a beam to the photocell on the other side until a passing railway car interrupts the light. This causes the photocell unit to set in motion a relay which operates a signal. The beam crosses the track at about the height of the standard car coupling.



DESIRE of the auto manufacturer to clear front compartments of the gear shift lever is reflected by a patent which probably will be applied at an early date. It calls for the gear lever to project from an opening in a housing extending upward from

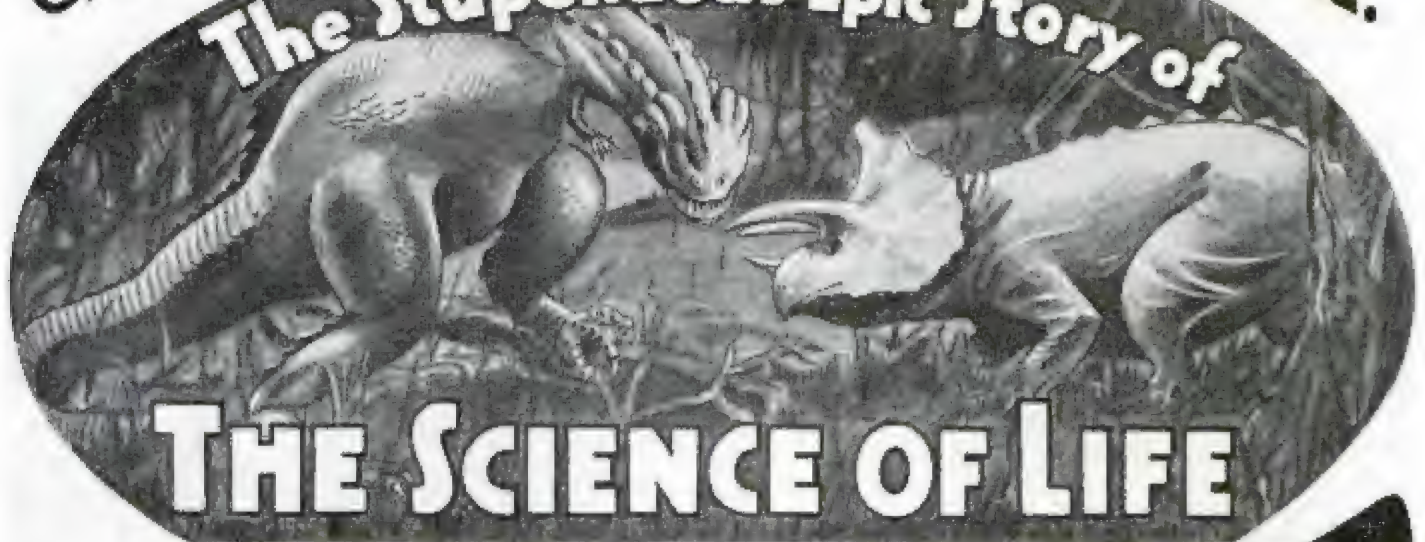


the transmission to the instrument panel. Thus, the lever, instead of consisting of a long rod extending from the middle of the floor, becomes a short rod projecting from a point just below the instrument panel.

DECORATING the out-of-doors Christmas tree might be made easy by using a recently patented clip for attaching electric lighting sets to the branches. Made of lightweight weatherproof metal, the clip locks around the small branches and holds the lighting set's double wire near each socket, thus helping to support the bulb in the position desired. Designed for attaching or detaching quickly, the clip has no sharp points that will injure tree or the hands. It will not come loose in high winds.



And now **THE GREATEST GIFT OF ALL!**
The Stupendous Epic Story of



THE SCIENCE OF LIFE

H. G. Wells's Great Sequel to His Famous "OUTLINE OF HISTORY"

HERE, in one vivid, constantly fascinating narrative, Wells has given you *everything* you can want to know about LIFE on earth! It is a more absorbing story even than his celebrated *Outline of History*, which gave millions of people their first clear ideas about the development of their world. In *The Science of Life* he has gone farther—he reveals the mysteries of the human body and human behavior; of animal life; life in the sea; insect life; reptiles and birds; plant life. In unforgettable phrases and illuminating pictures H. G. Wells (in collaboration with Julian Huxley and G. P. Wells) unfolds the secrets of the embryo, of heredity, sex-life, the workings of your body, the stories of prehistoric animals and all other living things.

Originally published in four volumes for \$12.00, this work is now presented complete in ONE magnificent volume of 1514 pages—and you may have it free if you accept free membership in the Guild—now.

Guild Membership Is FREE

THE Guild selects for your choice each month the outstanding new books before publication—the best new FICTION and NON-FICTION. "Wings"—a sparkling, illustrated little journal—comes free each month to members. It describes the forthcoming selection and recommendations made by the Editors, tells about the authors, and contains illustrations pertinent to the books. This invaluable guide to good reading comes a month in advance, so members can decide whether or not the selected book will be to their liking. You may have the Guild selection any month for only \$2.00 (plus a few cents carrying charges) regardless of the retail price. (Regular prices of Guild selections range

from \$2.50 to \$5.00.) Or you may choose from 30 other outstanding books recommended each month by the Guild—or you may order any other book in print at the publisher's price. But you need not take a book each month. As few as four within a year keeps your membership in force.

You Save Up to 50%!

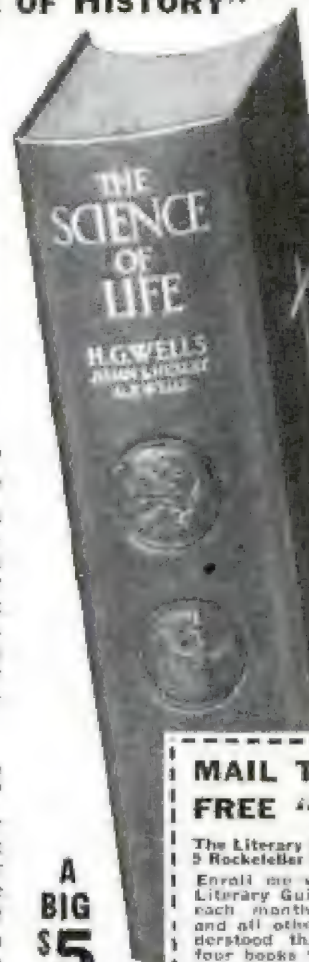
Guild savings are not merely fractional savings. You get \$3.00, \$4.00, or \$5.00 books for only \$2.00. Your book bills are cut in half. You can also get free "bonus books" twice a year. Details of this popular feature sent to you upon enrollment.

SUBSCRIBE NOW — Send No Money

Remember: Members buy only the books they want, and they may accept as few as four books a year. The Guild service starts as soon as you send the coupon. Our present special offer gives you H. G. WELLS'S "THE SCIENCE OF LIFE" absolutely free. This book will come to you at once, together with full information about the Guild service and special savings.

LITERARY GUILD OF AMERICA, Dept. 12 P.M.S., 9 Rockefeller Plaza, New York

When writing to advertisers please mention Popular Mechanics



FREE
 TO NEW MEMBERS
 OF THE
 LITERARY GUILD

**1514 PAGES
 387 PICTURES**

*Hundreds of Fascinating
 Subjects Like These:*

Nervous Mechanism, Brain
 Reproduction, Fertilization
 Growth, Development of
 Embryo
 Childhood, Adolescence,
 Maturity
 Mammals
 Birds, Reptiles
 Fishes, Insects
 Vegetable Life
 "Missing Links" in
 Evolution
 Man's Body
 What Determines Sex?
 The Ages of Ancient Life
 Dinosaurs
 Behavior, Feeling, Thought
 Life Among Ants, Bees
 Counting in Animals
 Psycho-Analysis, etc., etc.

MAIL THIS COUPON TODAY FREE "The Science of Life"

The Literary Guild of America, Dept. 12 P.M.S.,
 9 Rockefeller Plaza, New York

Enroll me without charge as a member of The Literary Guild of America. I am to receive free each month the Guild Magazine, "WINGS," and all other membership privileges. It is understood that I will purchase a minimum of four books through the Literary Guild within a year—either Guild Selections or any other books of my choice—and you guarantee to protect me against any increase in price of Guild Selections during this time. In consideration of this agreement, send me at once, **FREE**, a copy of H. G. Wells's "The Science of Life."

Name.....

Address.....

City..... State.....

Occupation.....

Canadian Subscribers write direct to the Literary Guild in
 Canada, 385 Fonge St., Toronto, Canada

A
BIG
\$5
VALUE

**SEALED POWER
PISTON RINGS**

*are standard equipment
in the 1938 models of*

**12 OUT OF THE 20
AMERICAN MAKES
OF AUTOMOBILES**

*These twelve Sealed Power
automobiles sell more than
80% of all American
automobiles*

The World Runs on Sealed Power

If your car is using too much oil or has lost its pep, ask your repairman to install Sealed Power Piston Rings for replacement. Accept no substitutes. Insist on the piston ring preferred by America's automobile manufacturers. Best in new cars! Best in old cars!

Popular Mechanics Magazine

REGISTERED IN U. S. PATENT OFFICE AND CANADA

WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 68

DECEMBER, 1937

No. 6

EASIER SHIFTING *in* 1938

CONCERTED action of the automobile industry to make gear shifting easier than ever before is revealed by the 1938 models. At least nine manufacturers offer means of controlling gears from steering column or dash, the others introduce improved clutches and transmissions designed to reduce the work of driving.

There are four types of gear controls in which the lever is removed from the front compartment floor: the self-shifting hydraulically operated transmission, optional on Olds and on Buick "40"; the selective automatic



*Top, location of vacuum shift lever on the Nash.
Bottom, Pontiac with gear shift lever moved from
floor to steering column*

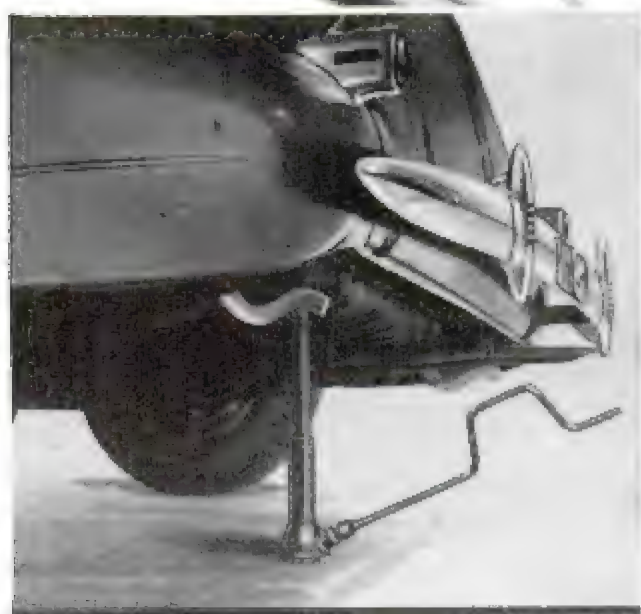
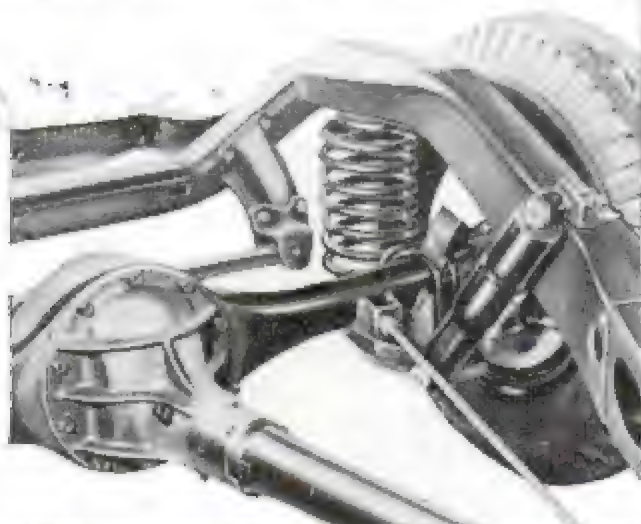


shift or "electric hand," optional on Hudson; the vacuum shift, optional on Nash, Studebaker and Graham, and the remote control, optional on Pontiac and standard equipment on LaSalle and Cadillac.

The first type, General Motors' self-shifting transmission, is controlled by a lever located on the steering column just beneath the wheel. It will shift itself once the car is under way and automatically provides a selectivity of gear ratios to meet all requirements. Incorporated into this transmission is a fourth speed, or di-

Leggett

rect drive, which permits the engine to run slower without reducing the car's speed and which saves gasoline and lengthens the life of the power plant. Introduced a few months ago as optional equipment on the Olds "8," the transmission requires use of the clutch only for starting and stopping. On down grades the driver may flip the control lever from high-speed range to the low



Top, back of Plymouth's front seat is thickly padded and rolled at top as emergency cushion in case of sudden stops. Center, Buick's coil spring suspension of rear wheel. Note hookup of spring and airplane-type shock absorber. Bottom, jack pad extends from rear of Pontiac chassis

range, thus employing second gear as a decelerating force.

Hudson's "electric hand," first of the shifting devices to find wide acceptance, controls the gears by means of a lever on the steering post and automatic clutch ac-

tion. The shifts are made in the usual manner, with a free-wheeling effect at speeds below eighteen miles per hour.

The vacuum shift, offered by Studebaker, Nash and Graham at extra cost, employs the power of vacuum to help the driver manipulate the gears. Gear shifting becomes a matter of finger-tip pressure applied to a short lever located on or just beneath the instrument panel and extending back to within a few inches of the right-hand position on the steering wheel.

Remote-control shifting, which consists of a steering column lever and proper linkage with the gears, employs none of the complicated mechanism of the automatic types. The driver shifts in the usual manner, using the clutch as he would with the conventional shift. The only difference between the remote shift and the conventional type is that the lever has been shortened and placed on the steering column instead of on the floor. The remote shift has two advantages, greater shifting ease for drivers of short stature and reduction of noise. The old type lever extending through the floor acted as a conductor of sound from chassis to the inside of the car.

Manufacturers retaining the conventional lever-on-floor transmission have improved clutches and parts of the gear-changing mechanism. Chevrolet introduces a simplified clutch which operates on the diaphragm principle and requires less pressure but gives more positive engagement than the one used last year.

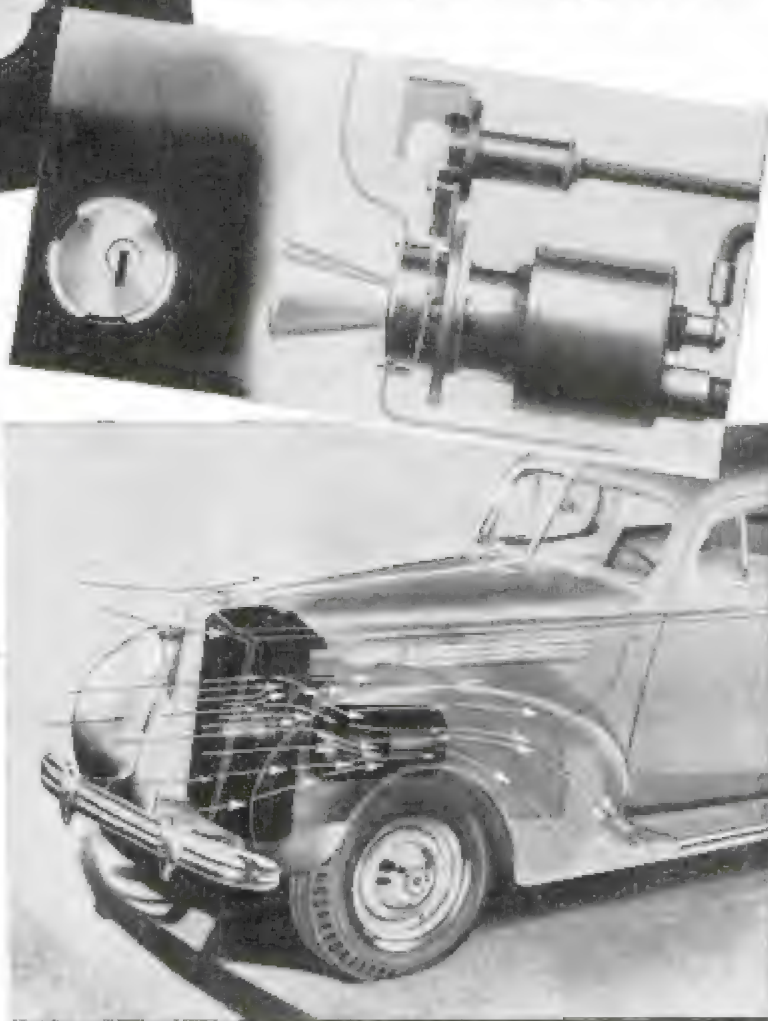


duced on the "junior" cars to give easy riding. Leaf springs are used, but static friction is practically removed from them. At the end of the spring leaves are cup-like depressions containing buttons, some of which are rubber and some oil-impregnated bronze. The forward ends of the springs are mounted in rubber, and rubber bushings are em-

Plymouth, DeSoto, Dodge and Chrysler all offer improved clutches which reduce driving effort. DeSoto and Chrysler have new blocker-type synchronizers in their transmissions to make the gears virtually clashproof.

Significant in the 1938 automobiles is the first step toward independent suspension of rear wheels. To General Motors' "knee action" on the front wheels, Buick adds torque-free springing which involves the use of coil springs, airplane-type shock absorbers and a radius rod on the rear wheels. The coil springs are mounted on the rear axle housing behind the axle, increasing the car's spring base by five inches. The low-pressure shock absorbers are used at the rear and the radius rod locates the rear axle and the wheels sidewise. As a result of this suspension, rear wheels track exactly where the front wheels lead, tendency to skid on curves, graveled roads and wet or icy surfaces is reduced and riding comfort is improved. Replacing heavy multi-leaf springs with light one-piece coil springs eliminates shackles and shackle bolts, bulky spring covers and other parts. Lubrication of the rear suspension is unnecessary, thus cutting down on the number of points to which service-station attendants have given attention.

Packard also attacks the question of rear-wheel springing with a system intro-



Top, Olds' automatic transmission is operated by short lever on steering column. Note the unusual dash. Center, Chevrolet's illuminated ignition lock. Bottom, Packard's system of conducting engine's heated air away under the car

ployed in the spring shackles. One end of these bushings has a thick integral rubber flange. A flange is formed on the other end when the shackles are drawn up, because the bushing is longer than the spring eye. This avoids metal-to-metal surfaces in the shackles. A lateral stabilizer and a roll control bar are parts of the rear spring suspension. Insulated with rubber, the stabilizer consists of a steel tube extending from the right rear spring pad to the end of a vertical bracket attached to the left side rail. There are two of these tubes on



Top, Graham's vacuumatic gear shift lever, which is within easy reach of driver. Bottom, "face" of the new Graham suggests speed. Note unusual treatment of headlamps

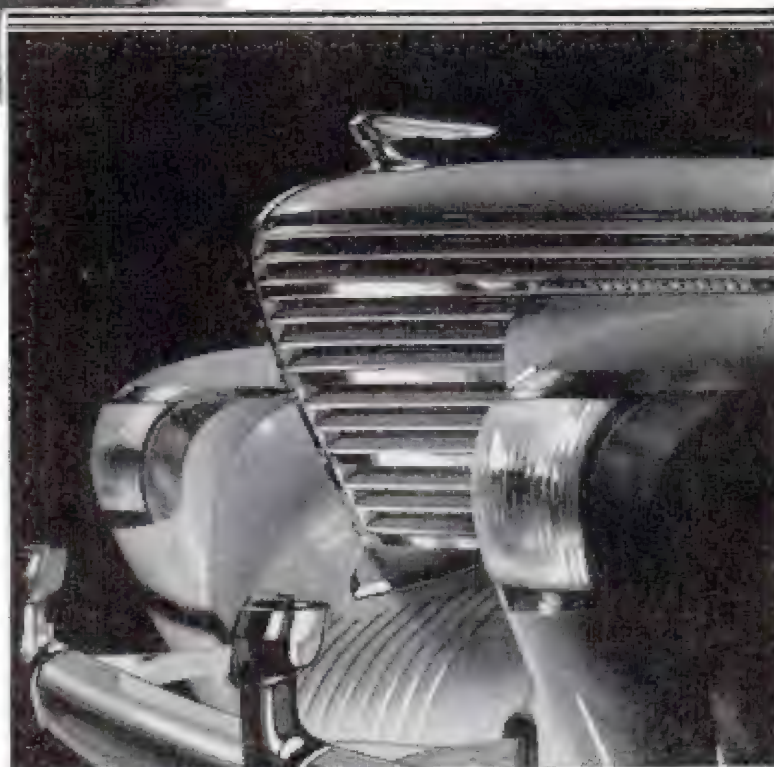
the "senior" Packards. Two-way shock absorbers on the "junior" cars are mounted so that on one the arm extends forward, while on the other it extends to the rear. This mounting supplements the resistance of the more flexible springs against braking or starting torque reaction of the rear axle. Packard retains the independent front-wheel suspension.

Almost unanimous is the decision that the battery should be placed in a more accessible position for servicing than under the floor or front seat, so the 1938 cars have batteries under the engine hood. Some of them are housed in a special compartment provided with a duct through which is carried an air current for cooling the battery. Olds has a long, narrow battery located alongside the engine, permitting the use of short battery cables which reduces line loss of electricity.

Increased wheel base is a feature of sev-

eral new models. Packard Eight, with a wheel base of 127 inches, becomes successor to the "120" which had a wheel base of 120 inches. The Packard Six measures 122 inches from center of front wheel to center of rear wheel, a substantial increase over last year's wheel base. DeSoto and Chrysler Royal have 119-inch wheel bases, three inches longer than those of 1937. Hudson's body is two inches longer.

Distinctive styling is found in the Graham, which gives the illusion of high speed while the car is standing still. The front fenders, in which the headlamps are set flush with the leading edge, seem to be leaning into the wind and the same line is duplicated by



the radiator grille as it rises to the unbroken sweep of the hood. Photographs of the car at a standstill have the same speed lines recorded in action pictures made at the speedways. Concealed door hinges, door handles which so blend with the belt molding that they are scarcely visible at a short distance and liberal use of plastics are other features of the Graham. Surrounding the instruments, decorating the

(Continued to page 154A)

Model Autos Reflect Boy Builders' Ability

Reflecting the creative ability of the boys who designed them, two model automobiles recently won scholarships for the builders. Entries were judged on originality of design and artistic merit, proportion and balance, workmanship, painting and color application, practicability and scale fidelity. The awards were made to the two boys, Teddy Mandel, aged fourteen, and Charles Bangert, Jr., nineteen, by the Fisher Body Craftsman's Guild. Young Mandel, competing in the junior division, submitted a two-tone model of novel design with the engine in front, while Bangert, in the senior division, placed the en-



Top, Teddy Mandel, holding model, and Charles Bangert, Jr., standing behind him, as they were awarded scholarships. Center, Mandel's model. Bottom, Bangert's entry.



engine in the rear and stipulated that the semblance of a hood he left in front should house an air-conditioning unit. Both models were designed along recognized principles of streamlining, Bangert using the bulbous front and sloping lines to the rear. The Mandel entry resembles the sharp-nosed automobiles in use today.

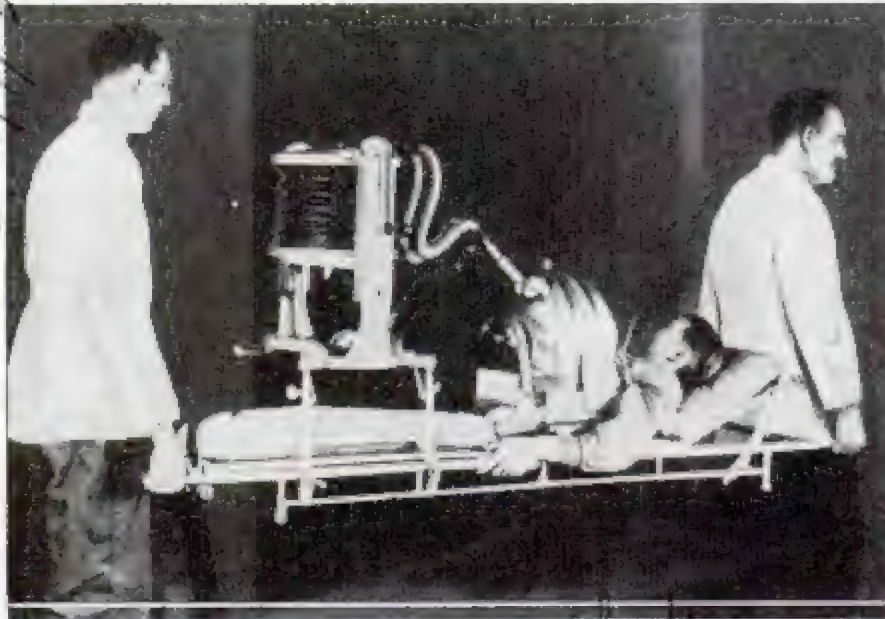
Carbon Dioxide Inhaled by Pilot Reduces the Effect of High Altitude

By adding a little carbon dioxide to the rarefied air breathed by a pilot at high altitudes, the effects of thin air on the aviator's mind and body can be reduced by the equivalent of nearly a mile in altitude. Tests of this theory were made in Harvard fatigue laboratory, simulating the oxygen conditions of flight at 17,000 feet. In this

thin air the memory and attention power of men dropped to sixty per cent of sea-level normal. But when three per cent of carbon dioxide was introduced into the air, the attention and memory figure rose to ninety per cent of sea-level normal, which is the percentage usually found in men flying at 12,000 feet.

Reported by Mr. R. A. McFarland

'Aluminum Lung' Permits More Freedom for Patient



Demonstrating simplified form of "iron lung" which permits the paralysis patient more freedom. It is made of aluminum

Made of aluminum and fitting over the chest and abdomen of the patient, a new type of respirator leaves part of the infantile paralysis sufferer's body free. Thus, much discomfort entailed by use of appliances covering the entire body are eliminated. The new "lung" allows for adjustments in treating kidney and other ailments.

Buildings Shaken to Remedy Annoying Vibrations

By means of shaking machines, engineers are studying the vibration periods of buildings in an effort to eliminate one source of annoyance to tenants. These shaking machines, intentionally operated out of balance, transmit a vibration directly to rigid members of a building's frame. As the frequency and size of the intentional vibrations are changed, the engineers find certain ones to which the building responds as a whole. In one Atlantic City, N. J., hotel, annoying vibrations were analyzed and finally traced to machinery of a power plant near by. Vibrations of the machinery, transmitted through the wet sandy soil, were synchronous with one of the dominant periods of vibration of the hotel structure. In this condition of vibration resonance the annoying oscillations,

while small, were passed on to the hotel's guests. Many things in, or around, a building may cause such vibrations. Sometimes unbalanced machinery will cause the trouble, or it may be wind gusts, subway or street traffic near by, or even the elevators.

Wind Instrument Has Keyboard Like Piano

Combining keyboard action with wind horn effects, the latest musical instrument is said to be easy to master. It is played by blowing through a mouthpiece and by fingering the keys properly.

This method of introducing the wind for the instrument creates closer coordination between player and instrument, as compared to lifeless introduction of air in many other instruments. The design is such that no strain, such as might interfere with proper manipulation of the keyboard, is put on the breathing apparatus of the player. Beautiful tones and effects may be produced by proper fingering and handling of the mouthpiece.



Playing the wind instrument. Note keyboard resembling that of piano or organ

Science Service

Felix Sonthheimer,
57 Amsterdam Ave.

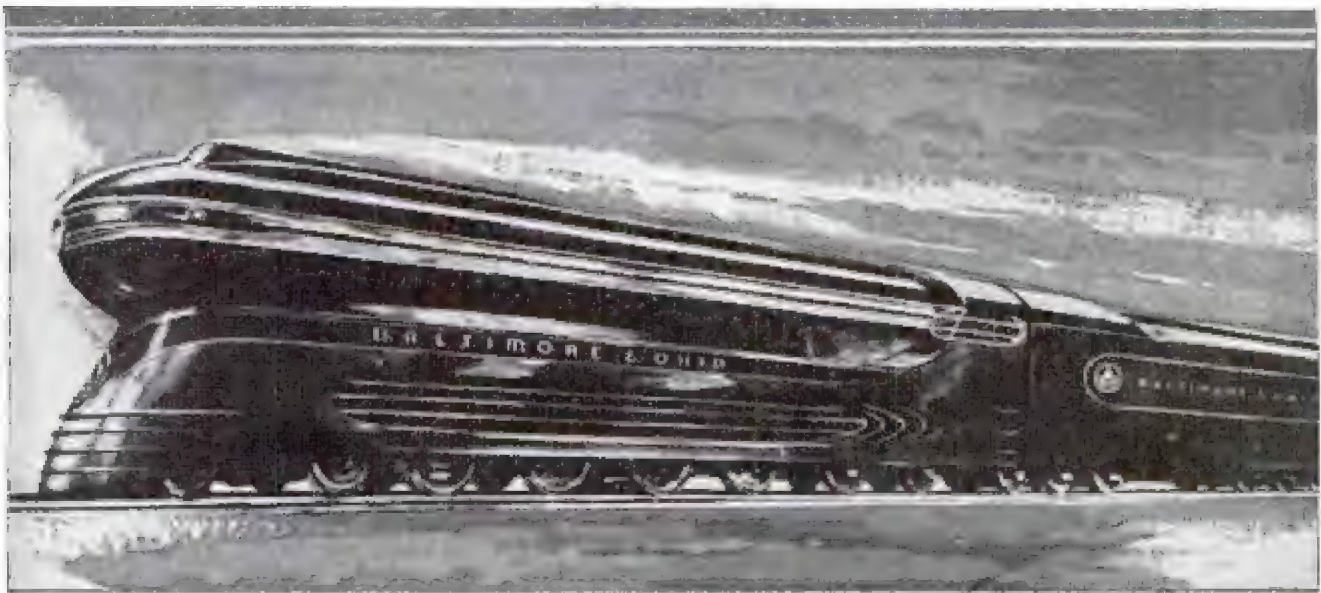
Ans. Dr. B. O. Sahlin
cannot locate 11/19/37

es 1125

no U.S. agent known

Huttag, Germany

Sixteen-Cylinder Locomotive Fast, But Quiet



Here is the latest thing in steam locomotives. Its sixteen cylinders give it the smooth flow of power common to the multi-cylinder automobile. The streamliner is rated at 5,000 horsepower

Designed to operate with the smoothness of a multi-cylinder automobile, a 5,000-horsepower locomotive will pull fourteen heavy coaches at 100 miles per hour for the Baltimore and Ohio railroad. It will have sixteen cylinders arranged for constant torque and will produce thirty-two power impulses for every revolution of the steam motors. Absence of reciprocating parts will reduce vibration and track pounding. The locomotive, of streamline

design, will have a four-wheel front truck, four pairs of drivers, a four-wheel trailer truck and a tank mounted on two six-wheel trucks and carrying twenty-three tons of coal and 22,000 gallons of water. Each of the four driving axles will be driven by a steam motor, each of which will have four cylinders directly geared to its axle. All moving parts of the motors operate in a continuous bath of oil. Total weight will be about 400,000 pounds.

Automatic Sod Sprinkler Moves Along Football Field

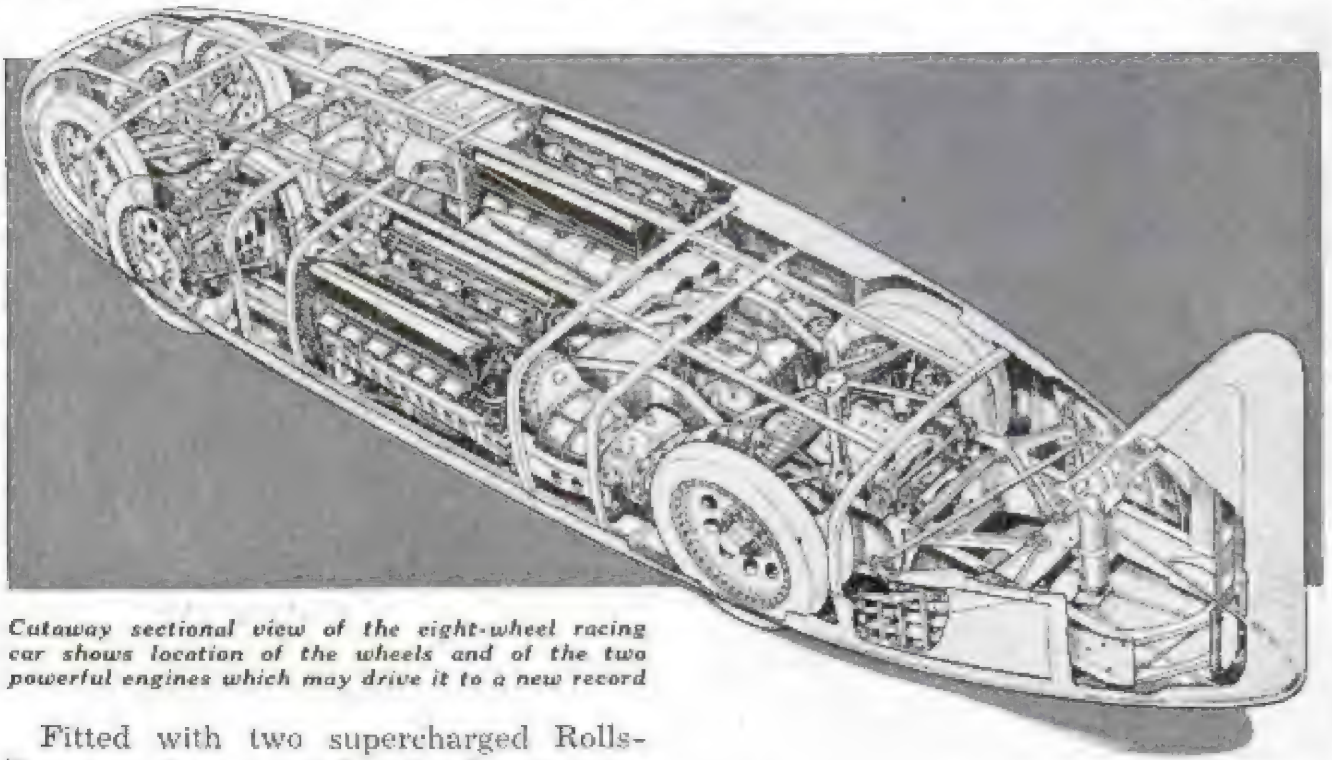
Sprinkling as it goes, an automatic device for keeping sod watered rolls slowly up and down the football field at the University of Nebraska. It was designed to sprinkle the field evenly without attention after starting. It is set to travel 130 yards in sixteen hours, in which time it will deliver one-quarter inch of moisture to the entire field. The sprinkler, after being started at one end of the field, is guided by a wire stretched between the goal posts. Water pressure operates the driving mechanism of a small outer wheel which travels in a circle. At the same time the sprinklers throw water the full width of the field. As the sprinkler revolves it turns a large wheel in the center, around which the guide wire runs, forcing the whole device to travel the length of the field. Use of the sprinkler saves the labor of several men.



Two views of automatic sprinkler which rolls down field as it waters the sod

Am. Soc. Eng. 1917
ref. of paper

Eight-Wheel Racing Car Has Two Engines



Cutaway sectional view of the eight-wheel racing car shows location of the wheels and of the two powerful engines which may drive it to a new record

Fitted with two supercharged Rolls-Royce engines, an eight-wheel racing car soon will be driven over Utah's salt beds in an attempt to break the world's land-speed record of 301.13 miles per hour. Steering is accomplished through the four front wheels. Tracks of the two sets of front wheels are different. The four rear wheels are installed side by side, dual fashion. A forty-gallon fuel tank is fitted

on the seven-ton monster. Ahead of the two giant engines, which are placed side by side in the center of the chassis, will sit the driver, Capt. George Eyston of England. With the power plant developing 3,250 horsepower and eight wheels giving increased traction, Capt. Eyston expects the machine to attain 400 miles per hour.

Glass Side Walls of Escalator Are Illuminated from Inside



Night view of the inside-illuminated escalator designed with glass walls

With side walls constructed of glass, the escalators in a San Francisco department store offer something new in illumination. Electric lights inside the side walls cast a soft glow on the moving stairs, giving sufficient light for shoppers' safety and enhancing beauty of the fixtures. The side walls are made of etched glass, the pattern of which is outlined by the lights.

Our Bureau of Information will answer questions regarding articles in this magazine, if accompanied by return postage.

Architectural Forum

CHEMISTRY *and* YOU



PART I

WITHOUT chemistry's assistance, particularly in the field of metallurgy, we could not produce or transmit the power to turn the wheels of industry.



CHEMISTRY guards motorcar quality. Here a chemist is determining the sulphur content of steel samples in the Chevrolet plant.

By Dr. C. M. A. Stine

Wilmington, Del.
Vice-President E. I. du Pont de Nemours and Company

IN the past century there have been three great phases of development so basically revolutionary that much or all of our economic structure has been embraced in the radius of resultant change. These may be described as, first, the introduction of steam power to machinery; second, the utilization of electric power, and third, the application of the relatively new science of chemistry to the whole wide range of man's material problems.

Steam and electric power gave us a new type of existence. Manufacturing passed from the home to the factory, from the hand to the machine. Millions left the farm for the town. Mechanical transport supplanted animal transport. We learned to talk great distances over

wires and finally without wires by radio. We learned to fly. The workday was reduced, leisure increased, and our standard of living was raised to a level previously undreamed.

Widely sweeping as they were, however, neither of these first two revolutions was complete by itself. Steam power gave us the locomotive but inventors were unable, despite numerous efforts, to apply steam satisfactorily to a highway vehicle. Success of the automobile had to await perfection of an electrical ignition system that permitted the use of gasoline, a new source of motive power. Too, steam power alone was insufficient to produce the telephone and the radio, or to effect any change in our methods of lighting, but when it was harnessed to a dynamo each of these impossibilities and

hundreds of others immediately became possible.

That is, they became possible within limits, but so definite were these limits that they precluded wide use of the more important inventions involved. Since the dawn of time man had been confined to natural materials to fill his needs. By no means were these always satisfactory, or as abundant as he would have liked, or as convenient to his reach, or as cheap. The materials of nature were filled with impurities, they were heavy

CHEMICAL research has played an important part in the improvement of the telephone. Here Alexander Graham Bell is opening the New York-Chicago line in 1892.

Photo courtesy Bell Telephone Laboratories



SAFETY glass is the direct result of chemistry. Below, dusting potatoes with calcium arsenate, a chemical.

when man would have preferred them light, soft when he wanted them hard, or solid when they should have been liquid. Progress halted before this barrier set up by a seemingly unchangeable and inscrutable nature.

The automobile is a notable example of how formidable this barrier was. To get strength in the car the early builders had to use metals such as went into locomotives and stationary engines. The result was a clumsy, unwieldy and expensive vehicle that no person of mod-

*Dusting potatoes with
calcium arsenate
& control Colorado
potato beetle.*





in the electric lamp, and indeed in most of the products of invention. The fault was not in lack of human skill, not in lack of vision, not in lack of money, but in lack of the right kind of materials. Throughout the length and breadth of industry this lack was felt. On every front it checked us—until chemistry broke through the barrier!

The modern foundations of chemistry were being laid in Europe while we were fighting the Revolutionary War. With

BEFORE electricity and modern household appliances, many of them the result of chemical research, invaded the home to lighten household drudgery, women worked in kitchens like these.

Photo Courtesy Westinghouse

erate means could afford. This vehicle then was equipped with rubber tires that were more unreliable than the weather and wore out after a few thousand miles of highly uncertain travel. Windshields and windows were of glass that shattered at the least impact. The leather-covered seats rapidly disintegrated, the gasoline and lubricants available soon choked the motor with carbon and gum, the painted surfaces became cracked and dull in six to twelve months, while rust ate into the machine's vitals at a hundred spots.

Obviously this car of only a generation ago was little more than an uneconomic plaything. It was faster than a horse but so unreliable in operation and so costly that if the future of the automobile industry had depended on it, that industry would be of small concern to us today. Similar shortcomings were inherent in the telephone,





813

Westinghouse's Suburban Century of Progress

peace we were quick to grasp their significance and the chemical industry grew rapidly in America. In the main, however, its function was to supply known chemical materials and only casual thought was given to creating new materials. The period was marked by a wider and more intelligent use of chemicals in bleaching textiles, in papermaking, in tanning, in steel fabrication and other lines, but problems of synthesis interested few outside of college laboratories.

Nevertheless some highly important chemical strides were taken that pointed the enormous potentialities of the science. In 1828 Wohler, a German, synthesized urea, a waste product of animals and humans. This was the first evidence that man



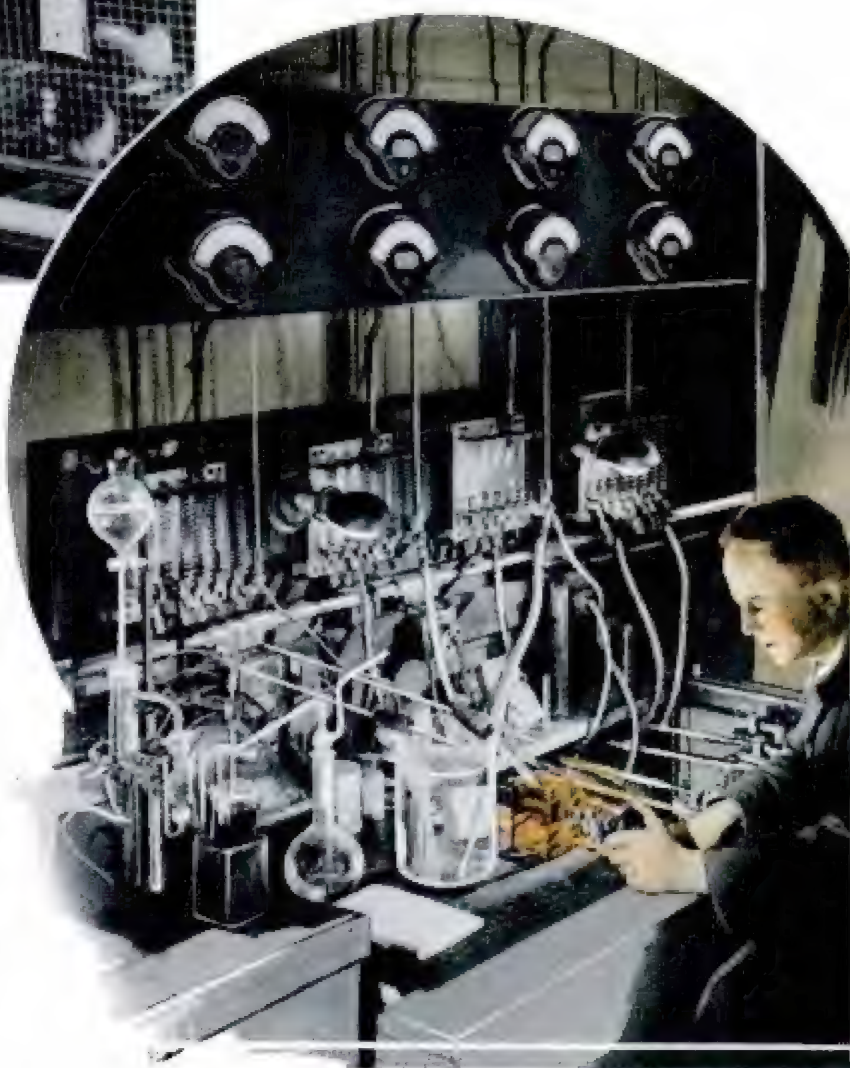
CONTRAST this up-to-date kitchen with the old-fashioned ones on the opposite page. The magic hand of the chemist has reached into the home as well as the factory.



literally "full of cells," is the fibrous material that makes up the structure of most plants and all trees. Therefore it is almost as abundant as the air.

Shortly after Schoenbein's discovery of nitrocellulose it was found that its explosiveness could be reduced simply by using less nitric acid. This gave us still another new material, pyroxylin. In 1869 Hyatt, an American, plasticized pyroxylin with camphor and created "Celluloid," the first of the synthetic plastics, out of which was soon being made a wide variety of things. Then de Chardonnet, a Frenchman, squirted nitrocellulose in solution through a spinnerette and got a fine filament or thread, which he then denitrated to reduce its flammability. This was the first man-made textile fiber, rayon.

These were basic discoveries. In them were the germ cells of a hundred new industries that in



814 RATS being prepared for vitamin D assay in du Pont laboratory. Right, controlling current into electroplating bath, one step in furthering knowledge of plating.

New Brunswick, N.J.
could make an organic substance, hitherto produced only in a living body, by chemically compounding inorganic substances. Seventeen years later another German, Schoenbein, treated cotton with a mixture of nitric and sulphuric acids and got a highly explosive new material he called gun-cotton, the technical term for which is nitrocellulose. Cotton, chemically, is almost pure cellulose, a chemical term you should remember, because you handle something made of chemically transformed cellulose almost every waking hour. Cellulose, which means



SPRAYING body of car in Pontiac plant. Durable, quick, drying finishes developed by chemistry have made possible the mass production of automobiles. Top, demonstrating a chemical agent for flameproofing fabrics. Untreated fabric is at left, the treated one at right. At far left is treated mattress on which gasoline has been ignited. The gasoline burns, the mattress does not catch fire.

effected by the work of two mighty pioneers of science, Pasteur of France and Ehrlich of Germany.

Many believe the World War led to the establishment of a chemical industry in America. What actually happened is that an already formidable American chemical industry woke at the time of the World War to its own enormous potentialities, and what is equally important, to its own deficiencies. In 1914 the official census did not bother even to list American-made dyes, although on dyes were dependent textiles, leather, paper and other industries employing 1,200,000 workers. Our farmers had to buy potash from Germany and nitrate from Chile. Our

E. B. Alvard, manager. *Specialty Sales Section*
see July 1934 - 19
Eshibit at New York
Museum of Science and Industry

time would consume cellulose by trainloads. Equally important was the isolation of aluminum by electrochemical methods. This achievement by Charles Hall, a twenty-two-year-old chemistry student at Oberlin college, placed in common use a metal that previously had been almost as precious as silver. Then Perkin of England discovered dyes could be derived from coal tar, Goodyear found a way to vulcanize rubber, invention of the electric furnace led, among other things, to new abrasives and high-speed cutting tools, and a wholly new conception of chemistry's relation to medicine was

see July 1934 - 19
Eshibit at New York
Museum of Science and Industry



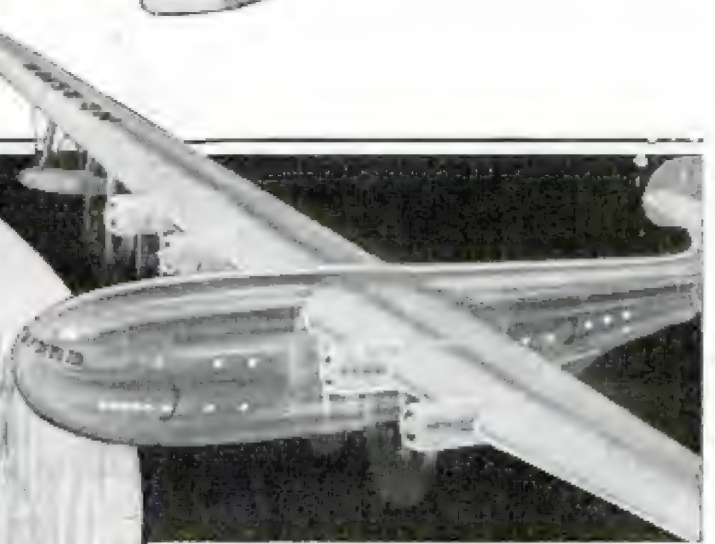
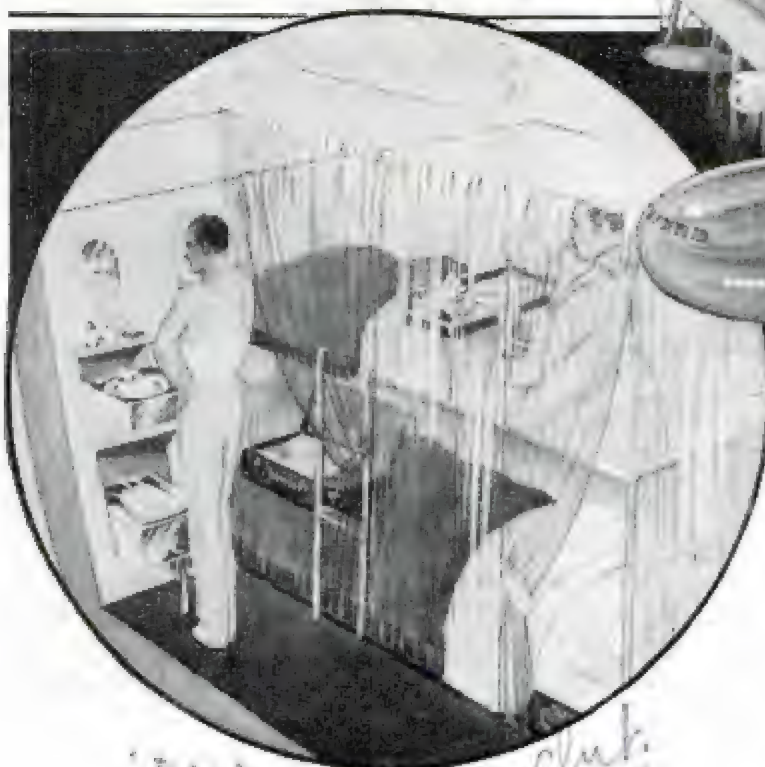
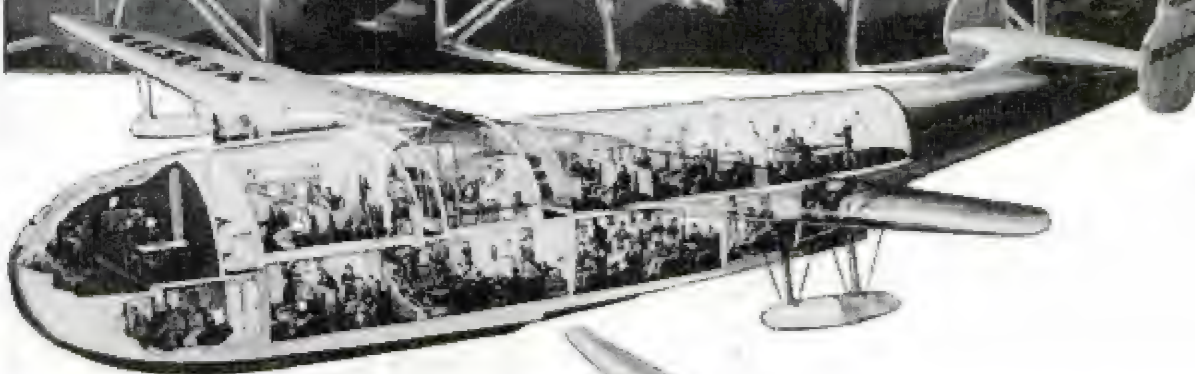
RACKS on roof for making exposure tests of finishes. Above, examining paint and lacquer samples for cracks or other imperfections.

physicians and hospitals had to buy German medicines. In inorganic chemistry we were fairly well fortified, but Germany ruled the organic chemical world—the world of almost infinite promise. All of our coal-tar chemical plants together employed only 528 workers. Hard upon chemistry's awakening, more than \$300,000,000 were invested in chemical buildings and equipment by American colleges and schools and an even greater sum was invested by the chemical industry. One company, du Pont, spent \$50,000,000 in the development of dyes alone.

Only seventy-one doctorates in chemistry were conferred in 1914. This number multiplied seven times until in 1934 it was a third of all the doctorates conferred. The number of chemists rose from 14,000 to more than 30,000, while the corporal's guard of workers in coal-tar chemicals grew to an army of 11,000. Something of a similar nature took place in all of the leading nations, but nowhere was it
(Continued to page 132-A)

Es 1099

Giant Atlantic Flying Boat to Carry Sixty-Four



Here is an artist's ideas about how the transatlantic flying boat designed by Glenn L. Martin will look upon its completion. Top, lounge of the sixty-four passenger ship. Center, cross-section of the craft, and, below, night view of the fifty-five ton boat. Left, typical stateroom. Passenger accommodations include sixteen compartments, bar and lounge, observation deck and ping-pong room. Four engines will propel the great ship at a cruising speed of 170 miles per hour

Clark

C. Baltimore, Md.

459 South Serrano.
Los Angeles, Calif.



Above, thirty-foot rose trees in the wonder garden were grown from seed, not budded. Inset, "perfect" yellow rose, formerly produced only in hothouses, is grown in wind-swept garden

AN ORDINARY little garden in Santa Barbara, Calif., is crowded with potentialities for tomorrow's science and realities in horticultural miracles. In it are roses which grow nowhere else on earth, roses with unbelievable colors and shapes, giants and dwarfs, roses with strange histories and stranger uses. The garden,

which is one of the outposts in the struggle for scientific knowledge, represents the life work of Father George Schoener, a Catholic priest. Father Schoener says of his work, "The world is full of theories of how plants get their characteristic colors, shapes and smells, of how those characteristics may be changed from generation to generation. It

Moved - no address

es 1069

Below, black rose bred from two very dark red roses. Right, Dr. Schoener at work. Bottom, left, pure white rose which is grown on same bush as dark yellow one, shown at right

of ROSES

is the business of science to find out how these things work, and to theorize afterwards."

Down the center of the garden runs a double row of rose trees. They tower thirty feet into the sky, as tall as a row of pine saplings. There is something unbelievable about them. Yet these giants of the rose



family are not budded. They were grown from seed. A long history of careful breeding for a single characteristic, height, lies behind their gigantic size.

Close to the avenue of giant rose trees is an insignificant bush. It blooms irregularly, but when it does, the world sees a

black rose. Only a tiny bit of dark red on the edge of some of the petals shows how it has been bred from crossing the very dark-red plants. Of the creation of this bud, Dr. Schoener says, "It is only logical to presume that if two very dark roses were crossed the next generation would contain a rose darker than either of the originals. Remember, that is only a theory. Science is not made of theories, but of



facts. So I made my experiments, and eventually succeeded."

Near the black rose is a large and ordinary looking bush. It bears quite normal red roses. But when you come near the leaves of this plant you discover that the foliage gives off a scent. Crush the leaves in your fingers, and there arises an unbelievably strong smell resembling the Scotch sweet briar. There is good reason for this characteristic odor. It was from the Scotch sweet briar that the scent was bred into Dr. Schoener's red rose.

Climbing over the low fence which surrounds the garden is a rose with small oval leaves. This is far less stubborn than the black rose, and blooms regularly each spring. Its flowers are one primary color which roses never have—blue.

"It is simple," Dr. Schoener says. "After all, flowers must get their color from somewhere. There is only one place from which it can come—the ground. I once made an experiment. I impregnated the soil around a white rose with cobaltic acid. Within a few days the



Top, tagged and listed sticks mark Dr. Schoener's dahlia plantings. Center, giant white dahlia which holds beauty longer than ordinary dahlias. Bottom, giant rose trees in bloom

flowers of the plant were a rich cobalt blue.

"Now what occurs in an ordinary rose? The cells which give a rose its color have the ability to collect and hold chemicals which combine to form a color. The soil contains chemicals which will produce a blue color. It is only necessary to find roses which chance to have to a small degree the power of secreting blue-producing chemicals—and then to intensify. I will show you what I mean by intensification."

In the center of the garden is a brilliant yellow rose. It has an intensity of color which makes the bright commercial yellow rose seem pale and washed out. All yellow

(Continued to page 144A)

Wallet for Small-Size Film Has Transparent Pockets

Candid camera enthusiasts using thirty-five millimeter film will find use for a wallet which provides space for forty strips of seven negatives, each in transparent pockets, making 280 frames. Alternating with the negative pockets are white pages ruled horizontally to produce eight spaces on



Handy film wallet. Prints on right-hand page identify each shot on the negative

each side of the page. These spaces are for placement of one by one and one-half contact prints so that they are adjacent to the negatives. There also is ample space for recording of data pertaining to the picture.

Electric Reed Organ on Wheels Is Played at Games



Playing the grid-organ. The instrument is designed for use at football games

Believed to be the only instrument of its kind in this country, an electric reed organ on wheels help the rooters for one college football team. It has four sets of reeds, a built-in tremolo and its own power unit. The music is picked up by a series of microphones inside the instrument and amplified. There also is an outside microphone, making it possible to broadcast announcements. Reeds, keyboard and other parts were taken from old theater organs.

Hole Bored in Bottom of Lake to Let Out the Water

When a Texas ranch owner wanted to use a shallow lake bed for growing pasture grass, he solved the problem of draining out the water by boring a hole in the bottom of the lake. Knowing that water was found in that locality about 400 feet down, in extremely porous structure, he bored a twelve-inch hole to a depth of 384 feet and tapped the porous section. In three days all the water drained from the lake. A fine screen over the hole kept mud and trash from stopping it up. So simple was the job, opening up forty acres of rich land to cultivation, that other ranchers in the same area are using the same method.

Sound films can be produced in any number of languages by recording music and noises separately from the language texts, then mixing them and copying on the picture strip.

Developed by Herr
Karl Robert Blum

Cigarette Paper Tests Leather for Automobile Makers

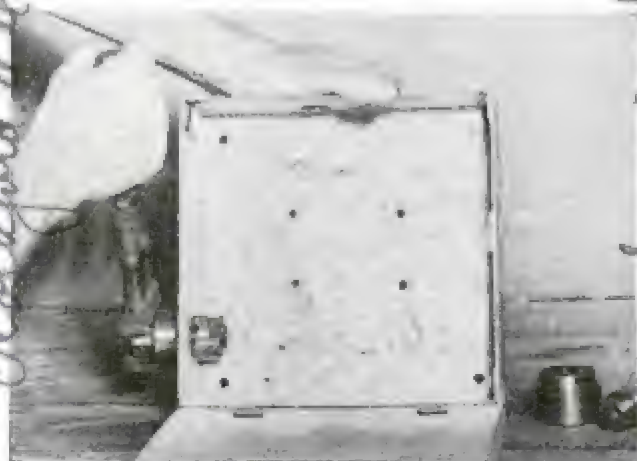


Ready to test automobile leather samples with cigarette papers in oven

Color-fastness of leather samples is determined for the automobile manufacturer by a cigarette paper test. Inside an electric oven heated to 175 degrees, the paper reveals any tendency of the leather to ooze sub-surface oils, carrying pigments and dyes that might stain clothing.

Holes Cut in Heavy Metal with Simple Hand Tool

Holes corresponding to pipe sizes of the common diameters may be cut in metal cabinets or sheet metal of heavy gauge by a hand tool now on the market. The holes are made as quickly as a hexagon head bolt can be turned up with a wrench and

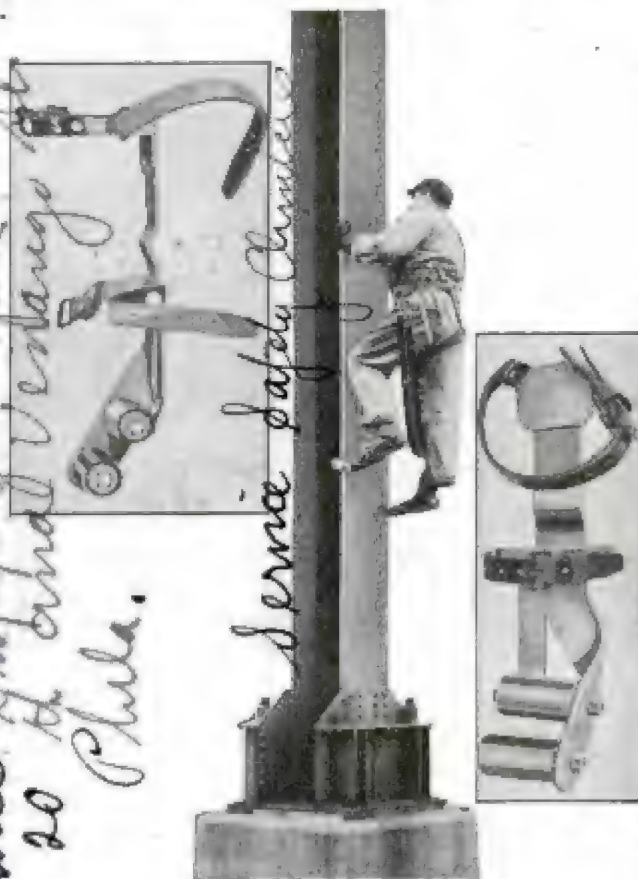


Cutting hole in metal cabinet with handy die set and an ordinary wrench

the edges are as perfect as though done in a power press. Bolt and outside die are placed in a knockout hole, if one is in the side of the cabinet, and the cutting die is placed on the end of the bolt on the inside. Turning the bolt with the wrench forces the cutter into the recessed portion of the outside die and shears out the metal. If no hole is in the cabinet, a three-eighths inch one is drilled and the smallest die used. Then the size die required for the larger hole is employed to complete the job.

Climbing Steel Girders Is Easy with Non-Slip Shoe Irons

Vertical steel girders can be climbed almost as easily as stairs if the workman uses a new type of shoe iron now available. The edge of the girder is grasped between two roller-like grips which can-



Climbing irons for scaling steel girders in use. Inset, views of the irons

not slip once the rollers contact the girder. The irons, made of lightweight, durable steel, are strapped on the shoes, with the gripping rollers at the toe. All points of contact between climbing iron and girder are cushioned so that the iron cannot dig into the steel nor mar the paint surfaces.

see October 1937



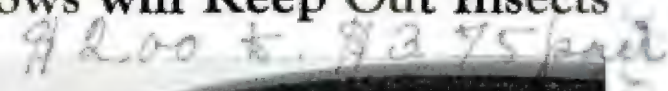
1890-1891

in
ra
w
es
di
cy
R
th
G
m
m
m
co
ho

Palencia Germany

Ante. Union A. S., Berlin Cicerstrasse

se
de
ch
of
se
se
m
n
on
by



100

Tiny Motorized Trailer Home Pushes Its Driver on Tricycle



acme
This tricycle is driven entirely by hand, pushed by the motorized trailer which is furnished with home comforts for a long tour of this country

With a "pusher type" trailer for his home, a young Californian is touring the country on a tricycle. The miniature house on wheels has many of the comforts of home—bed, radio, running water and other furnishings, all packed in a compartment seven feet long and four feet wide. The trailer has a one-horsepower motor operated by remote control from the tricycle seat. The maximum speed is about thirty miles an hour. It is driven entirely by hand, the owner having lost the use of his legs in a childhood accident.

Reversible Motor Runs Toys at Variable Speed



Toys, window displays and self-winding electric clocks can be operated by a small, self-starting and reversible electric motor which runs at variable speed without commutator, brushes, reversing switches or rheostats. It

operates on alternating current and can be adjusted to run at virtually uniform speed in either direction, regardless of sudden fluctuations in

voltage and frequency. The motor is stopped, started, reversed, speeded up or slowed down by manually adjusting a segment which can be locked in any desired position. An alternating magnetic flux induces currents in the adjustable segment, providing a rotor propelling torque and a rotor opposing torque together at the same time, or separately. The rotor is in the direct path of the flux and induced current where repulsion and attraction are strongest, hence the turning motion.

Christmas Tree of "Cellophane" Never Needs New Lights

Electrically lighted Christmas trees with foliage made of Cellophane are on the market for decoration of table, mantel and window sill. One style is equipped with miniature electric bulbs, another with tiny



Four of the new Cellophane Christmas trees. A central bulb lights the tree

glass candles. The trees fit over a separate white painted wooden base having a central bulb from which the light passes through the glass rods of the decorations

James Research Laboratories

Shelton Corp
232 111 North

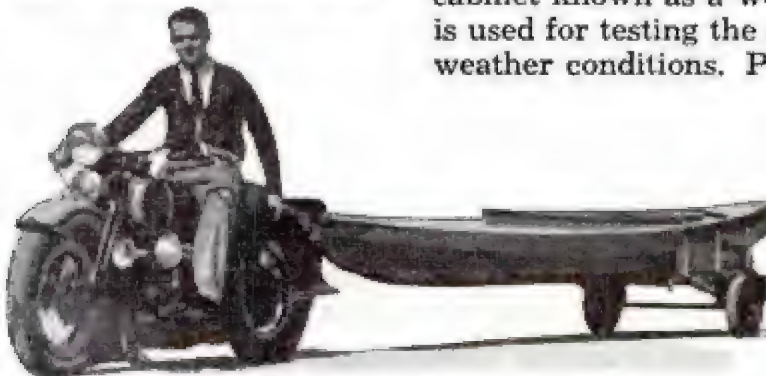
Mr. J. R. James
1128 Addison St. Chicago
Fredgie Carson
Santa Ana, Calif.

Chicago
Shelton Corp. 232 W. North

to give the effect of burning candles or lamps. Hence, the miniature bulbs and candles never burn out or need replacement. The base is fitted with cord and plug for attachment to any electrical socket. The trees are obtainable in green, red, blue or white Cellophane with lamps or candles in assorted colors.

Trailer for Boat Is Attached to Motorcycle

Capable of carrying a 400-pound load, a boat trailer for motorcycle is reducing the costs of outings for one Californian. It is thirty-six inches long, thirty-nine inches wide and has a body thirty-two inches wide. Fitted with aircraft wheels and cantilever springs, the trailer weighs thirty pounds. The boat, a kayak, weighs forty-five pounds, leaving plenty of carrying capacity for camping equipment and supplies. The hitch is a ball-and-socket joint attached to the bow of the boat. This requires a sturdy craft. The kayak is sixteen feet long, thirty-two inches wide and it is covered with airplane fabric.



Ready for an outing, with boat trailer attached to motorcycle. Camping supplies may be carried in the boat

Weather Made to Order in Box for Testing Materials



You can literally "turn on the weather" in this cabinet, designed to test the durability of paint, rubber and other materials

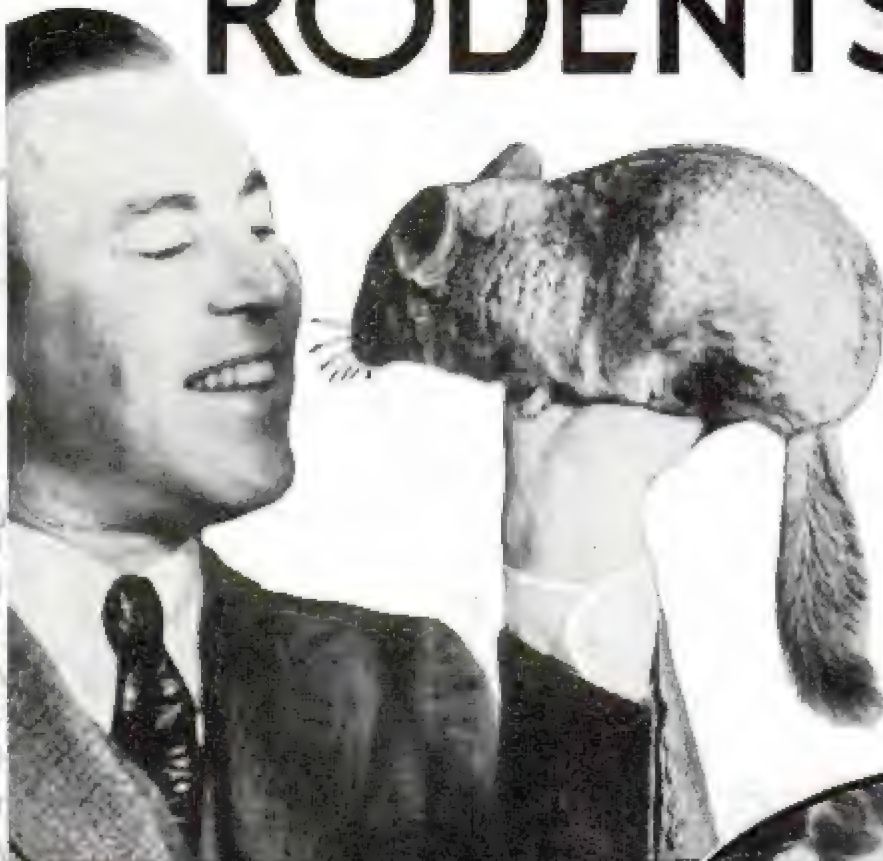
By adjusting a few knobs and dials, any kind of weather desired—fog, rain or blistering heat—can be produced in a cabinet known as a weatherometer. This weather machine is used for testing the durability of materials under various weather conditions. Paint, building material and electrical

insulation all can be tested in the cabinet, one of which is used by the city of Los Angeles to test products employed in transmission lines, towers and buildings.

Our Bureau of Information will answer questions regarding articles in this magazine, if accompanied by return postage.

Richard H. H. H.

RODENTS worth



know instinctively that the little creature was an aristocrat among fur-bearers. A closer examination of the fur would reveal that the pearl-gray color of the back softens as it approaches the under side. This lends distinction to a coat of chinchilla because at every movement there is a rippling, chameleon-like color change.

If you were to go into the shop of a Fifth avenue furrier and offer \$50,000



WHAT is the rarest fur in the world? That question put to a group of international pelt dealers would be productive of but one answer: chinchilla. Not only the rarest, the experts might add, but the most luxurious, the most expensive. Compared to chinchilla even Russian sable seems cheap.

Perhaps, you are a little hazy about this costly fur. If a live chinchilla were thrust into your hands you might dismiss it as one of Nature's mistakes, a rabbit with a squirrel's tail. But as soon as you had allowed your hand to sink into its deep, silky fur you would

cash the chances are you couldn't get a chinchilla coat. You might be shown a cape but no coats. There just aren't enough skins available to make one. And if there were, a full-length coat would require be-

Top, R. E. Chapman with chinchilla worth \$1,600. Center, chinchilla which may reach an age of twenty years. Bottom, breeding records are kept for each animal on the farm

Wells L. Parker,
90 Chapman-Chinchilla Farms

their **WEIGHT** *4957 W 204 St* **in GOLD**

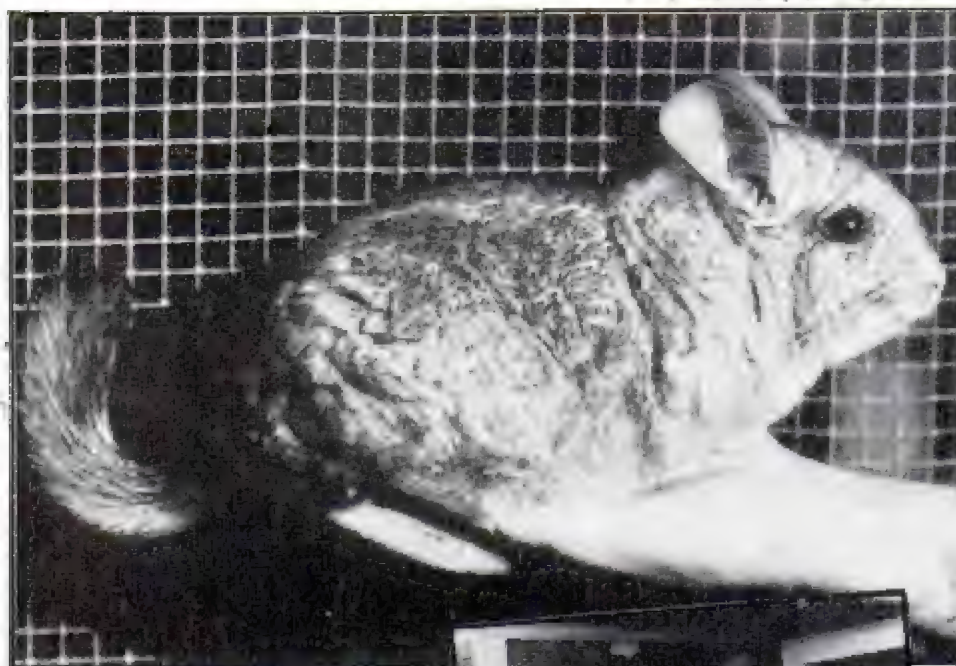


Left, a chinchilla coat like the one above would be worth more than \$50,000. Circle, marking the animals by tattooing a small number on the ear

tween 120 and 140 separate skins. At \$90 to \$100 per pelt, you can figure the cost yourself.

Small wonder then that pelt dealers and furriers are watching with keen interest the developments at a two-acre farm in southern California where \$1,750,000 worth of chinchillas are being raised. The 1,108 animals on this tract represent almost a world monopoly, since they are virtually extinct in the wild state. Behind this unusual circumstance is the story of a country's misused natural heritage and the vision of an enterprising mining engineer. For centuries these toy-like rodents had lived on the barren slopes of the Andes in South America. A shy, furtive fellow, he made his home in the crevices of rocks and ventured into the open only at night to feed and exercise. His beauty hastened his

see 780 W. 1932



Top, the chinchilla looks like a rabbit with a squirrel's tail. Center, before entering the housing units, attendant must step in antiseptic sawdust to prevent germs from reaching the animals. Bottom, treating a chinchilla in the laboratory

downfall. Chinchilla skins brought high prices and there was always a waiting market. With no thought of the future, hunters and trappers began slaughtering them in wholesale fashion. More and more pelts turned up in the world fur markets and by the turn of the century, the yearly export of skins from Chile reached an all-time high of 435,000 chinchillas.

The rodents might have survived this thoughtless butchery had it not been for the coming of hunt-minded Europeans to Chile. They brought with them the red fox, and the chinchilla was slated for a quick fade-out. Realizing it hadn't done right by the little fur-bearers, the Chilean government in 1918 placed an embargo on both hides and animals, forbidding their exportation. Although the hunters and trappers were restrained the red foxes were ready to carry out the chinchilla extinction program alone.



A year or so later, the late M. F. Chapman, a mining engineer, was working in Potrerillos, Chile, when an Indian trapper came down from the mountains with a chinchilla in a basket and offered to sell it to him. Chapman bought it and after watching the little creature for a while he was struck with the idea of bringing several of them to America to raise.

When he discussed his idea with his co-workers they told him it was a wild dream. Since the days of the Inca chieftains, chinchillas had lived in the rarefied atmosphere of the Andean peaks—they would never survive elsewhere.

But Chapman could not be dissuaded. Any animal that had thrived in such a mean climate could live anywhere, he reasoned, and set about to prove his point. Indian trap-

pers were given provisions and sent out to capture a sufficient number with which to start a colony. For three years, some twenty-three Indians under the supervision of the engineer combed the slopes before eleven of the creatures were captured.

From a camp 17,000 feet above sea level, the homeward journey was started. It was a tough trip, beset with trials and difficulties. Gradually, from one level to another, from the high peaks to the lower ranges and finally to the coast, the valuable cargo was transported. Although he had little difficulty in securing official permission to take the animals out of the country, the engineer was forced to cope with many other difficulties, according to his son, R. E. Chapman, present owner of the farm.

"Father had booked passage on a Japanese ship," he relates, "and the captain said the animals would have to ride in the hold. This was out of the question so father rigged up a cage in a trunk and with the aid of friends, smuggled the seven males and four females aboard.

"When the animals were safe in the cabin, father told the captain that they were worth \$1,000,000 and that he would hold the shipping company liable for that amount if anything happened to them.

"I think he must have told the captain a few other things besides because he didn't come near the cabin during the voyage."

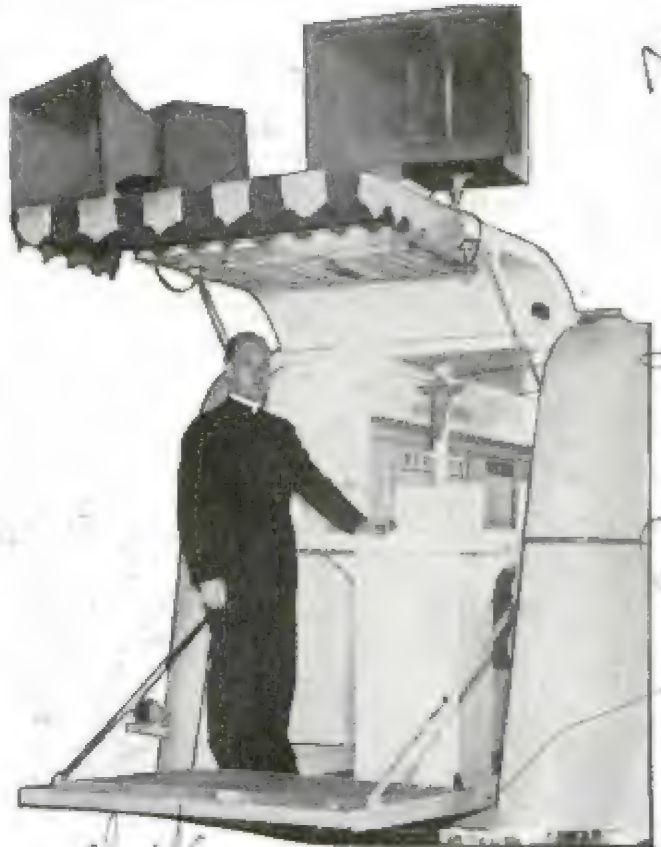
For three weeks, the engineer and his wife took turns in standing guard over the animals. They did everything in their power to keep them cool and healthy. When the boat landed, the eleven chinchillas were still alive. In fact, one had been born on board ship. However, the entire troupe had lost all their fur!

In the next two years, the experiment teetered on the brink of failure. There were many adjustments that had to be made. The animals were slow in acclimating themselves and would not breed. The third year proved to be the turning point, however, and Chapman's venture gave every indication of being a success.

Word of the experiment reached Switzerland and a fur syndicate dispatched an agent to the chinchilla farm to buy some animals for breeding purposes. The fur syndicate felt that Switzerland's climate was more suitable to the animals than that

(Continued to page 170A)

Trailer Chapel Has Altar and Loudspeakers



One of the missionaries standing at the rear of the chapel. Note the altar

Intended as the means of carrying two mountain missionaries on a two-year trip, a trailer chapel has been constructed with altar and loudspeakers. It also contains living quarters for the evangelists. The loudspeakers carry words of sermons preached in the open.

Reversible Waffle Iron Cooks Two at the Same Time



By using a reversible iron now available the housewife can cook two waffles at the same time. It takes no more space on the table than the usual iron. A heat indicator shows when the iron is at the proper temperature for use. The handle support is flattened at top and bottom to keep the iron upright. A double-expanding hinge at the back assures thick, light waffles.

Anatting, Bowman

Latest
MUSIC

Latest
in MUSIC

A black and white photograph showing four men in a control room. They are gathered around a large panel filled with numerous buttons and switches. The man on the far left is labeled '1', the man next to him '2', the man in the center '3', and the man on the far right '4'. They appear to be focused on the panel, possibly during a critical operation.

Top, Leopold Stokowski conducting orchestra. Bottom, main mixing panel for recording of movie music. Each of seven channels reaches the panel and the seven can be mixed as the director wishes

ductor, who, for many years, has studied sound recording and the possibilities of combining the skill of the musician and engineer for the production of a new music, worked out the details of this great experiment in sound recording. The action

Recording Engineer

Heanna Harbo es 781



adds Thrill **to MOVIES**

of the motion picture was filmed in Hollywood, but the symphonic music was recorded in Philadelphia. The reasons for this are: the acoustics of the Academy of Music, in Philadelphia, have been long rated as perfect; it was possible to obtain the services of the finest musicians without taking them away from their work in the

midst of a concert season, and Philadelphia was close to the experimental laboratories and staffs of R.C.A.-Victor in Camden, N. J. Instead of taking a huge orchestra of 100 men to Hollywood, Dr. Stokowski took the music in a trunkful of sound film.

The recordings were taken on nine separate channels, or sound tracks. Stands carrying two velocity type microphones were placed in each of the sections of the orchestra. There were seven of these dual microphone stands, one each in the strings, brasses, percussion, wood winds, cellos, bass section, and harps. These microphones were each especially "tuned" to pick up that section to best advantage.



Top, girl actress with Conductor Stokowski as they appear in movie. Bottom, battery of sound recorders to catch orchestra's music

(Continued to page 116A)

Water Atomizer Keeps Fruits and Vegetables Fresh



Fine spray keeps vegetables fresh. Inset, the atomizer connected to water line

For the fruit and vegetable merchant, the florist and the greenhouse operator, a simple water atomizer is available for spraying counter or shelves with an exceedingly fine mist. Thus may fruits, vegetables and flowers be kept fresh. The atomizer has three tips, the first providing an almost invisible mist, the second a heavier mist and the third a substantial spray. Double elbows make the nozzle adjustable to any angle. Another use for the atomizer is as a humidifier for home or office. Located over the hot-air register, it provides a fine mist that rapidly moistens the air, making it more healthful in winter.

Magazine-Loading Tack Hammer Carries Fifty Tacks in Head



Fifty tacks loaded into a magazine in the head of a tack hammer can be fed to the hammer, one by one, with a simple twist of the wrist. The hammer head

works on a spring hinge. The tacks are neat, octagonal-headed staples, serving the purpose of ordinary tacks. Its operation leaves the left hand free to hold the carpet or material being tacked.

"Flashlight" Car Brake Tester Has Red and Green Lights

Can you stop your car within a safe limit? It is easy to check the efficiency of your brakes with a deceleration meter just developed. It looks like an ordinary tubular flashlight, but on its face are two small round windows, one green and the other red; and there is a bubble-level on top of the case which helps in placing it properly on the floor of the car for a test. Inside the brake meter is a column of mercury. If the brakes stop your car fast enough to indicate proper braking efficiency, the mercury slides forward far enough to close a switch and flash a light in the green window; if not, the mercury reaches only the red signal. The instrument is calibrated to indicate efficient braking if the car stops within twenty-five feet at twenty miles an hour, the standard requirement in some states. It can be set for any other stopping distance desired.



Checking up on safety of automobile brakes with flashlight tester, seen on floor of car

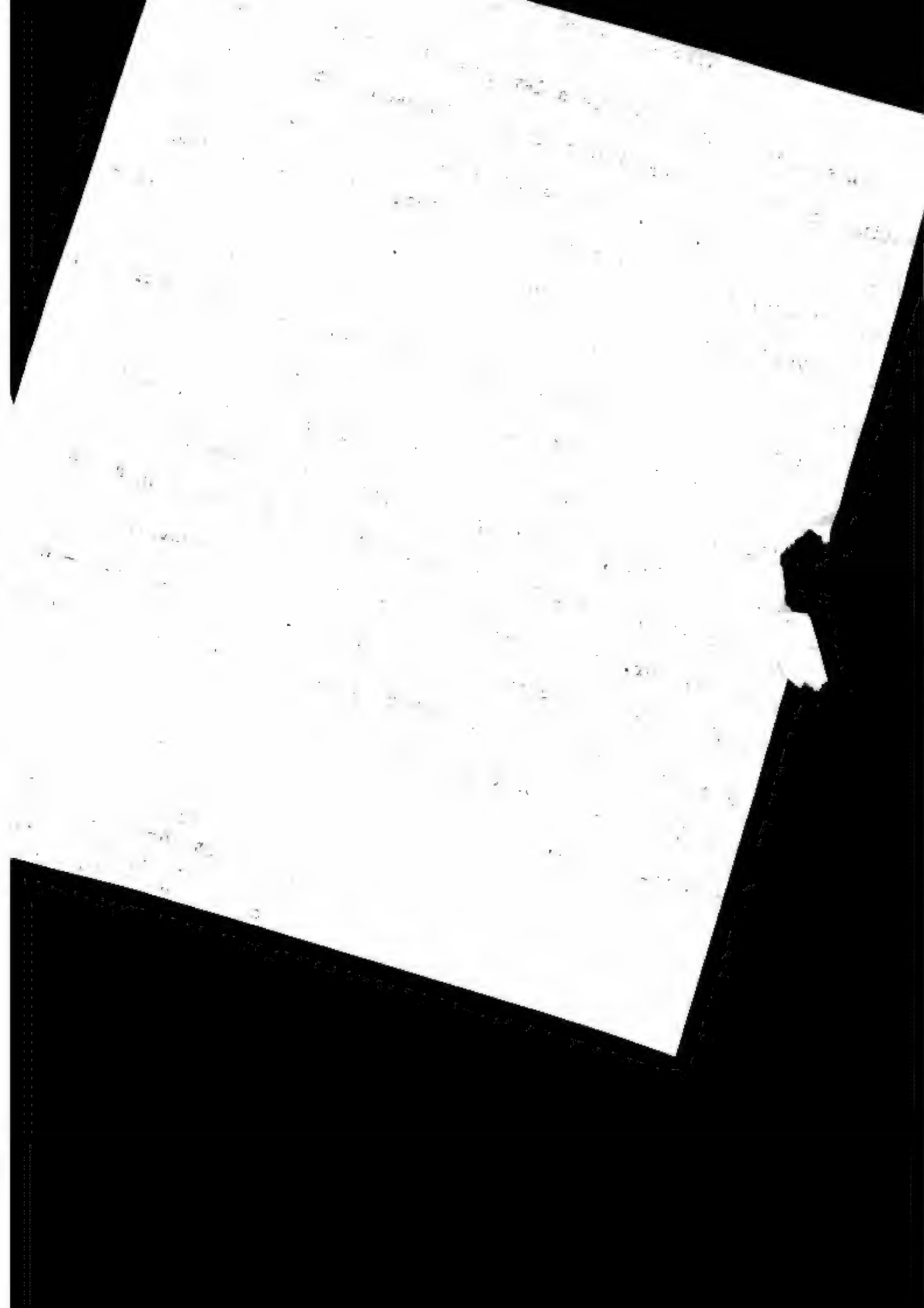
NEW TYPE OF GERMAN FIRE-PROOF PAINT

A new type of paint has been developed in Germany for protecting wood against fire incorporating nitrogen salts with a synthetic resin product. Upon contact of flame with the painted wood surface, the paint develops an insulating foam crust which effectively protects the wood against fire. This new type of fire-resistant paint was exhibited at the Achema chemical equipment exposition held in Frankfurt in the early part of July and attracted considerable attention from interested visitors.

Fireproof paints have been acquiring increased importance in Germany of late, especially for purposes of national defense and as protection against incendiary bombs discharged upon cities in time of war. Representative of the growing interest in these products is the municipal ordinance recently issued in a well-known city of Southern Germany requiring that all wooden roofs be painted with fireproof paints because of their resistance to the effect of incendiary bombs.

9

American Consulate General
Frankfort-on-Main, Germany
(Consul S. B. Redecker.
#15100 July 24, 1937)



Trailer Convertible into Permanent Cottage

Designed for permanent living but retaining all the advantages of mobility, the latest trailer may be converted into a trim little cottage. It is made in two sizes, one fourteen feet long and the other twenty feet long. Two, three or more of them may be combined to make a house of several rooms by plac-



Top, trailer in temporary location. Center, looking toward the kitchen. Bottom, trailer in permanent location, with steps and wheel skirting in place



layers, with dead air space between. Thus is constructed a lightweight, but heat and cold-resisting wall. The trailer is equipped with built-in furniture and appliances. Plumbing fixtures are designed for connection to city water pressure systems instead of to tanks, as in the usual trailer. If the owner finds a desirable spot, a skirting around the wheels, lattice work for flowers and a set of steps may be used to convert the trailer into an attractive cottage with the air of permanency.



ing them in the form of an "H" or a "C." One trailer might serve as a kitchen, another as living room and a third as bedroom. The unit is mounted on a sturdy chassis and can be towed at speeds of thirty miles per hour. An insulation material, first used by explorers in the Antarctic, is employed in wallboard form, being cut in prefabricated sections and applied in two

Fireproof Paint Guards Wood

Fireproof paint that may prove useful in resisting incendiary bombs in wartime has been developed in Germany. When exposed to flame, it forms an insulating crust of foam which is said to protect wood from burning. This paint is understood to contain nitrogen salts and synthetic resin.

Domasote - see letter - Chemical Dist. Millboard

The AWAKENING of the



Auto Club of So. Calif. photos

Modern prospectors in old car adapted to hill-climbing. In the background is the ghost town of Calico, former silver city of 4,000, that is still deserted

OUT in the west a few years ago you could drive off the beaten path and go exploring into the last century. Behind the shoulder of some hill or in a desert valley you would discover a full-sized town where no one lived. Along the sagebrush-covered main street would be weather-beaten stores, post office, banks, and saloons of a small city, flanked by blocks of unoccupied houses. In the eerie silence the flapping of old wallpaper behind a broken window or the creaking of a door would be the only sounds.

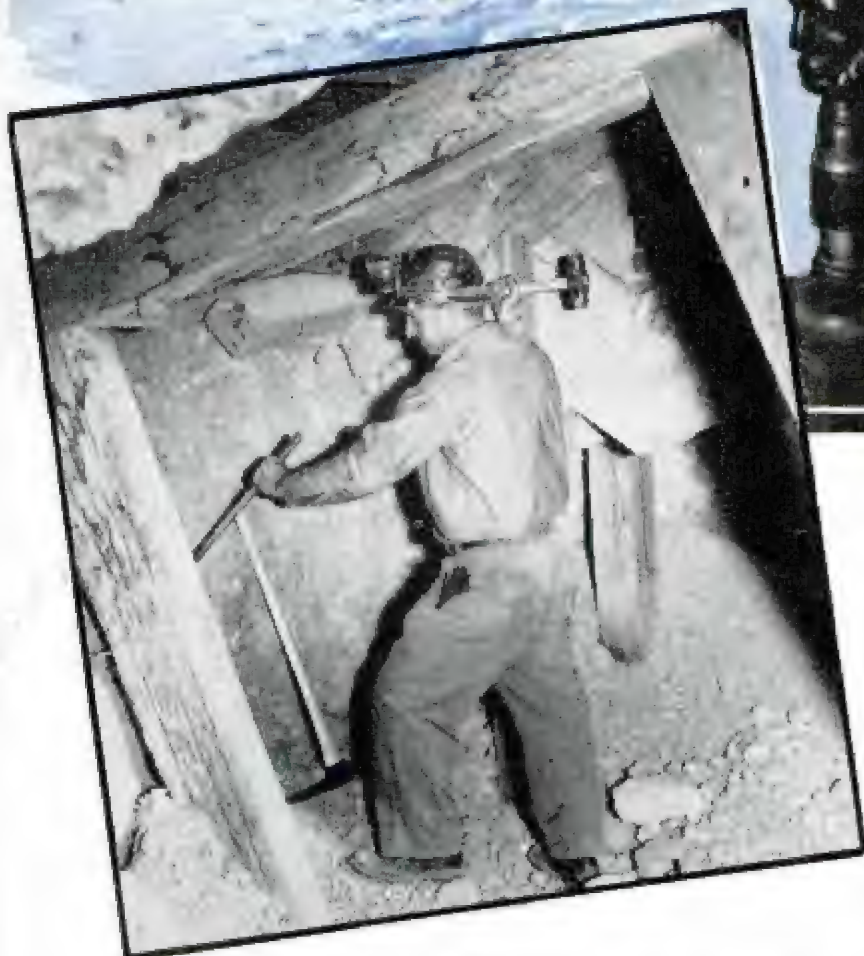
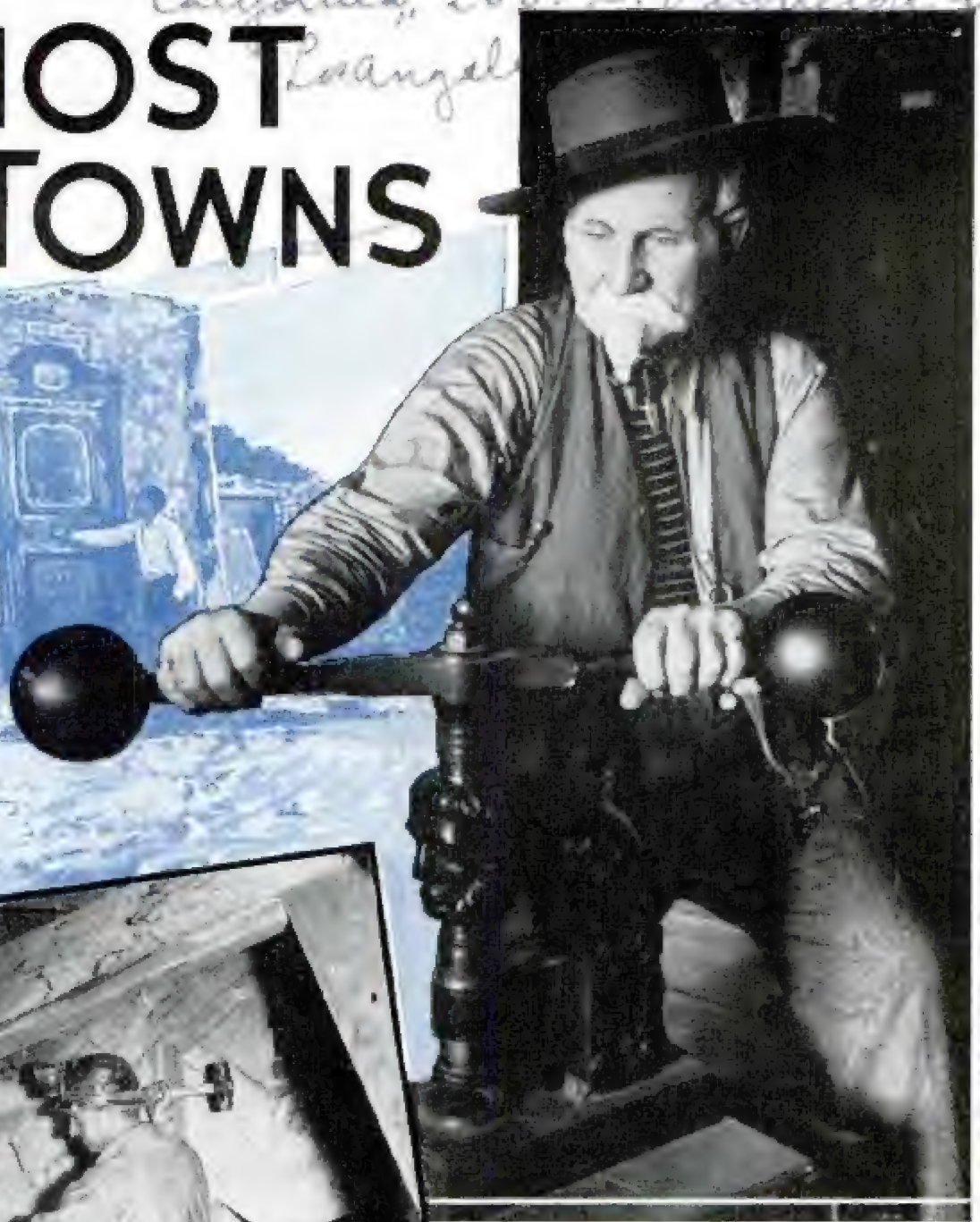
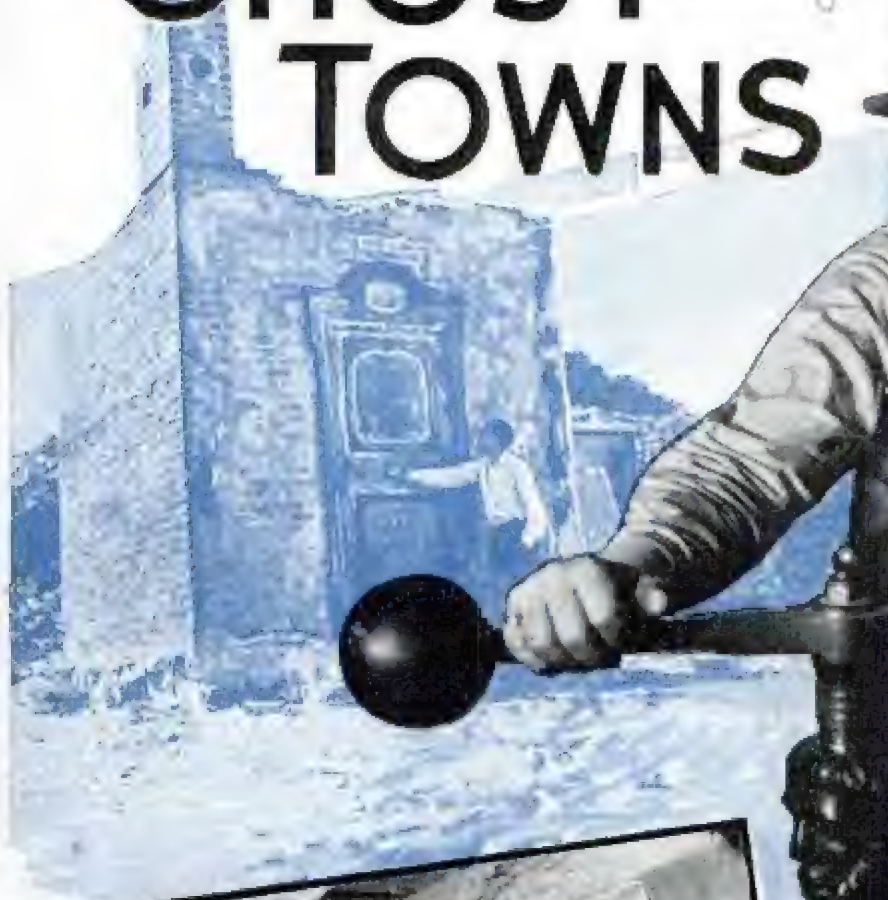
These ghost towns of the mining country were left intact when the gold fever died

or when bonanza strikes in other districts caused the inhabitants to move away overnight. Towns like Rhyolite with a pretentious railway station and office buildings, or Bodie, built with tremendous hardship high in the mountains, were left complete right down to stacks of dishes still in the kitchens and files of records still in the banks.

Today the ghost towns are coming back to life. Towns that have been asleep for seventy-five years are stirring again under the excitement of high-priced gold. Modern air-conditioned stores are springing up next to the tottering ruins of old

Reference: *Automobile Club of Southern California, 2601 S. Figueroa St. Los Angeles* MS 773.

GHOST TOWNS



Top, left, iron door and walls of bullion vault in deserted town of Bodie. Right, press used for stamping gold slugs circulated as money in '49. Bottom, modern miner breaking out samples of ore from abandoned mine

buildings. Livery stables where harness still rots on the walls are being torn down for gasoline stations. From Cripple Creek in Colorado to the Mother Lode in California long-abandoned mines are being worked again. A survey by the Automobile Club of Southern California shows that practically every old gold camp in the west is active.

The '49ers had a flair for colorful names and called their towns by such titles as Rough and Ready, Red Dog, Whiskey Bar, Shirt Tail, Poverty Hill, Squab-bletown, and Slumgullion. Some



Top, left, ruins of old stamp mill at Keyesville. Right, prospector selecting samples of ore to be crushed and sent through recovery machines. Bottom, \$10,000 bar of gold and silver recovered from hundreds of tons of ore

of the original names like Angels Camp, Yankee Hill, Coffee, French Corral, and Indian Diggins are still used today. One enterprising group of miners wanted to christen their settlement "23 Skidoo" but had to compromise on "Skidoo" when authorities of the postal department refused to recognize the number.

"In the old days a camp was apt to mushroom into a big town of six or seven thousand population in a few months," recalls one old desert rat. "People would start to flock in as soon as news of the new strike spread. At first they lived in tents. Then as freight services were organized and building materials were brought in a real town of stone, brick, and wood would be built.

"It usually cost ten dollars per mile to haul a ton of freight, but grand pianos shipped around the Horn, red-plush furniture, large mirrors, and fashionable clothing all were freighted hundreds of miles through the mountains to the latest boom town. Sometimes twenty mules per wagon were

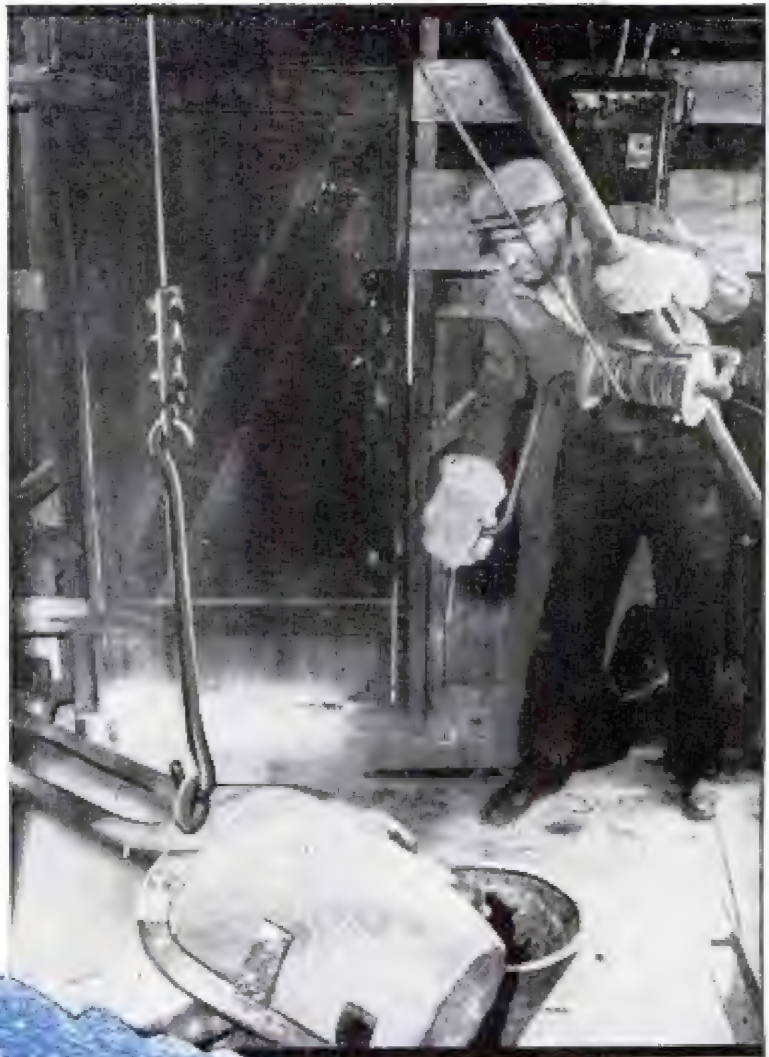
needed to move the freight over the roads. If drinking water had to be hauled to town it often cost more than gasoline does today.

"A few years later the whole town might pack up and leave. The population would fall from 6,000 to six or right down to zero in a few months. Shutting down of the mines, or a bigger, richer strike somewhere

on West bank of Kern river, a few miles from Cabella

else would cause the miners to leave. Usually they were in such a hurry that they didn't bother about their furniture and they rarely went back to get it later."

Until recently you could prowl through one of these abandoned towns and gather armloads of relics of the early days. Old gambling devices, cards, bottles that had turned purple from long exposure to the sun, records of early gold shipments lying scattered in the open bank vaults, all were there for the taking. Itinerant prospectors tore up the wooden floors of gambling halls and saloons to pan for gold dust that had spilled through the cracks. In Colorado smart treasure hunters looked for pack-rat nests in the abandoned towns. They were of-



Above, pouring molten gold and silver into mold, the last step in mining



Auto Club of So. Calif. photos

Above, beehive kilns used in the last century still stand in the Panamint mountains. Right, gold panner in Fish canyon in the Sierra Madre mountains

near Death Valley
ten rewarded by finding small collections of gold and silver coins, old watches, and other bright trinkets that the pack rats had stolen in the early days and hidden in their nests.

One collector of early relics, W. Parker Lyon of Arcadia, Calif., has assembled thousands of dollars worth of historical pieces from the ghost towns. Once he bought a furnished three-story hotel for fifty dollars when he wanted some of the

(Continued to page 122A)



Thirty-Five Foot Model Is Fair in Miniature



Top, workers completing model of exposition. Note tiny figures of spectators and of autos. Bottom, how the exposition will look from the air upon completion of all the buildings

Tiny lifelike figures, 5,000 autos much smaller than toy cars, many miles of esplanades, hedges, roads and canals are among the features of a thirty-five foot model of the 1939 Golden Gate Exposition. Every part of the exposition, and the man-made island on which it will be constructed, is shown by the model. Each tiny figure walking about the 400-acre grounds, re-

duced to a scale of one-sixteenth of an inch to the foot, is made of clay. Spectators seated in the model's athletic field bleachers are painted grains of rice. Under the artists' hands, crinkled Cellophane and spun glass have been converted into ornamental fountains. Carefully torn bits of animal and vegetable sponge have been made into trees. The model's palm trees

are colored strips of buckram, its bamboo is pampas grass and its low shrubbery made of cork and sawdust mixed with paint and varnish. The model is built on thirty sliding panels. It is being exhibited in its own structure, being a preview of the San Francisco fair.

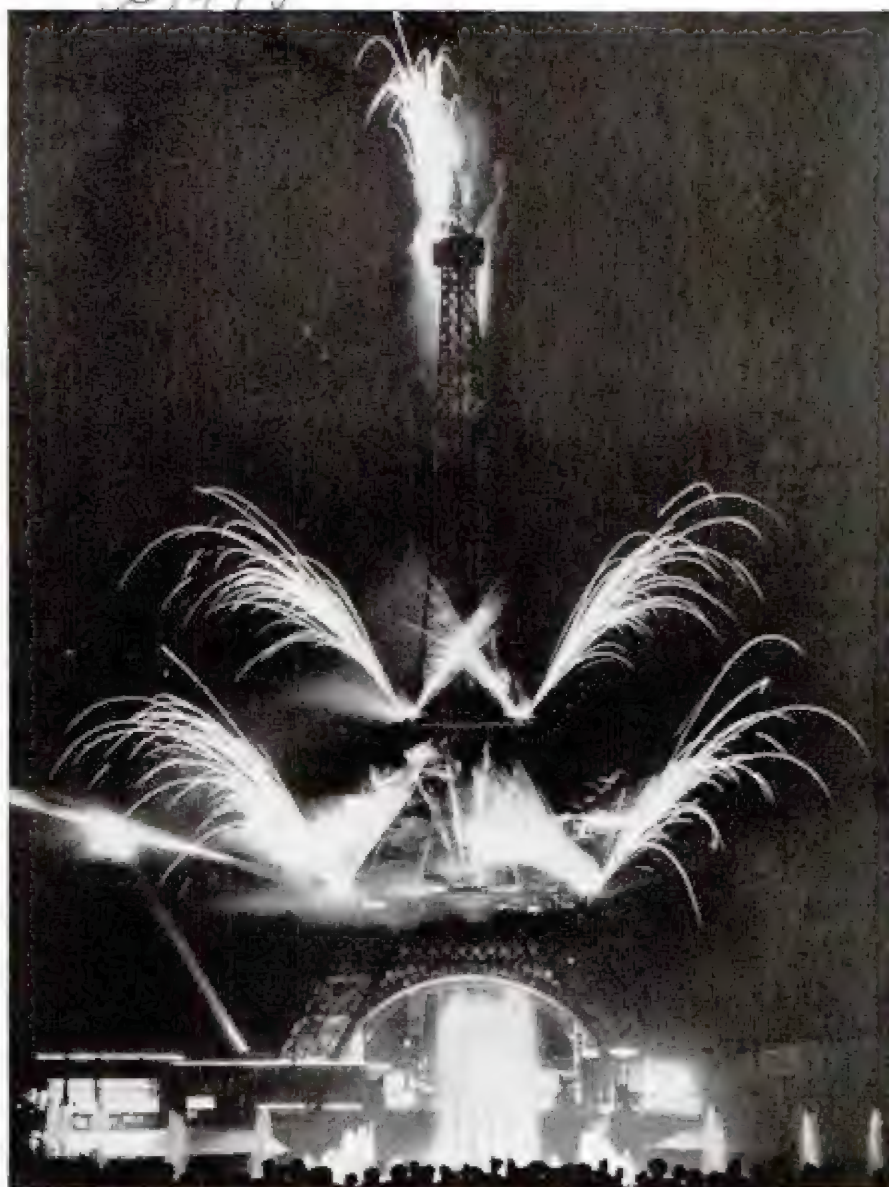
Windmill's Wings Fold to Give More Power

Wings opposite the driving wing of the latest windmill fold automatically as wind pressure slackens on one and is picked up by another, reducing air resistance to a minimum and resulting in more power. On test models resistance to the air was reduced almost ninety per cent by the collapsible wings. Four oil-seated springs act as governors, allowing the blades to fold when the wind reaches sufficient velocity. Four blades constitute a unit. Increased power may be obtained by bolting additional units, one above the other, on a main shaft.



Model of folding wing windmill, showing how blades fold as wind pressure stops

Eiffel Tower Is a Giant Vase for Fireworks Spectacle

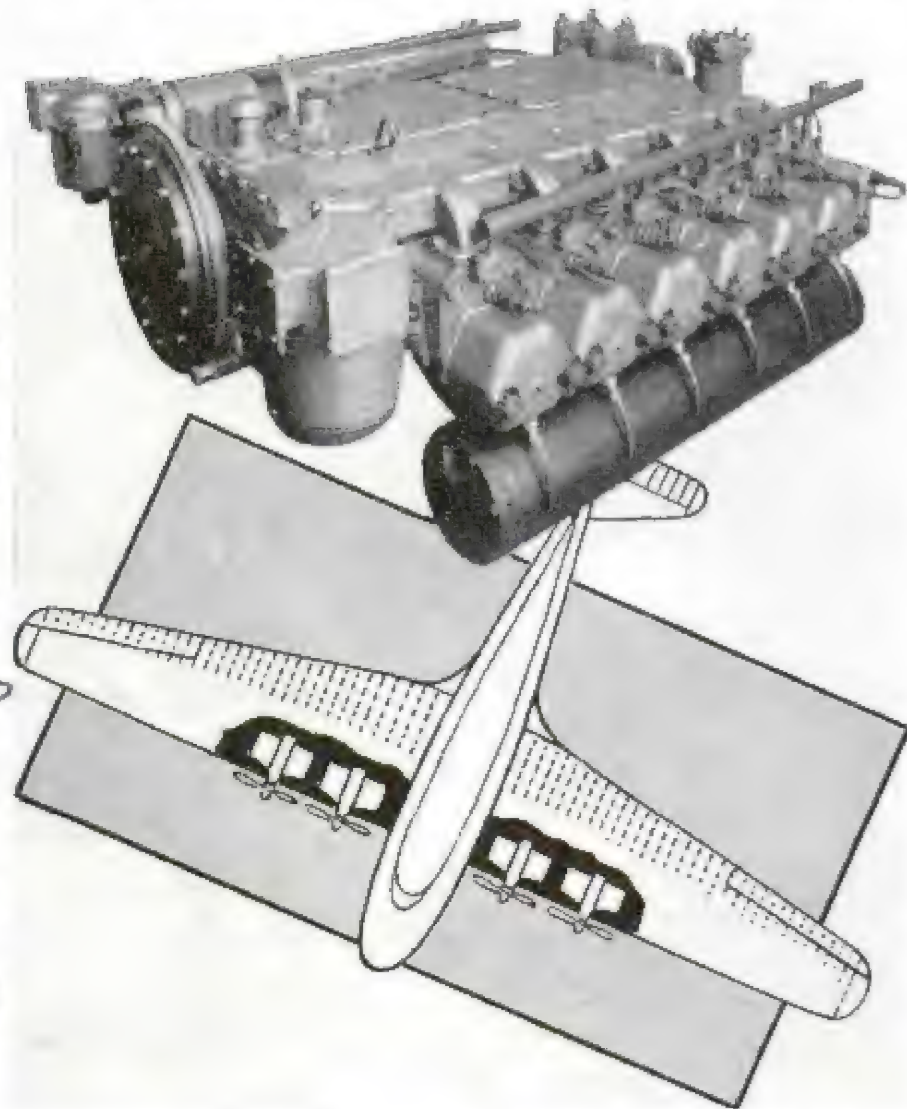


Spectacular view of the Eiffel Tower as fireworks are set off in one of the feature events of the Paris exposition

Fireworks stream up nightly from Eiffel Tower like great flowers of fire, growing swiftly and then vanishing. Built forty-eight years ago for the Paris exposition of 1889, the skyscraping tower is still a landmark and attraction for the exposition of 1937, and every night it is used as a great "vase" for the pyrotechnical display.

Popular Mechanics Magazine does not publish the name of the maker of, or dealer in, any device described in its pages, but this information is kept on file and will be furnished by our Bureau of Information upon request, accompanied by stamped, self-addressed envelope.

'Pancake' Diesel for Aircraft Permits Better Wing Design



Top, the flat Diesel engine for aircraft. Bottom, sketch showing how the engines may be installed in the wings of plane

Flat in the shape suggesting the name "pancake," Germany's latest Diesel engine for aircraft saves space and enables the designers to improve streamlining of the wings. The engine is somewhat similar in shape to the "pancake" gasoline motors being used in the United States for driving trucks and buses.

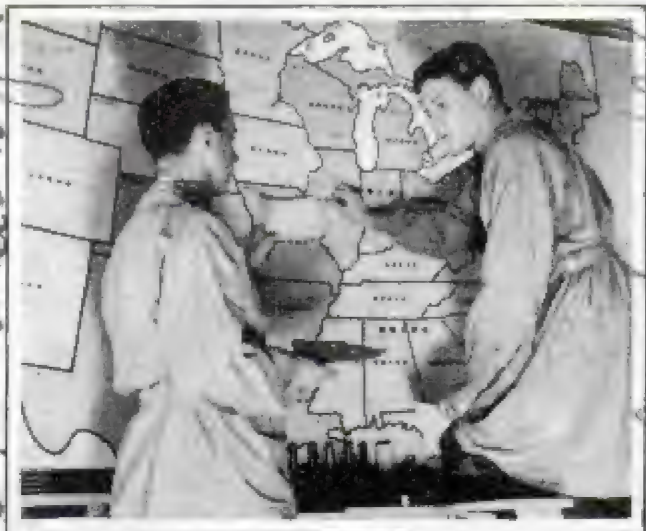
Water Made "Wetter Than Wet" by Synthetic Alcohol

Even the most water-resistant fabrics may be soaked with water made "wetter than wet" by a chemical agent developed recently. It is expected to be of great value to industries which require uniform wetting of materials, such as textiles. Cotton

fibers sometimes float on the surface of water for days without being thoroughly wet. This chemical, a synthetic alcohol, is effective even in hard water and makes it permeate the most resistant materials.

Auto Color Map Found an Aid to Car Builders

Helping the auto manufacturer to turn out cars which will please the customer is a color-preference map of the United States. The entire country is divided into seven zones or groups of states. Each week reports of customers' preferences in colors of cars are posted so that the trends may be seen at a glance. Strangely enough these trends do not vary greatly by season, but they do vary by geographical location. Black is the preferred color in the eastern and southeastern sections of the country, but lighter grays, browns, greens and blues are more popular in the far western states.



Posting the latest color preference for one state on the color map

Tergitol
Carbon

General Motors
Corp. Chevrolet

Camera Catches Racing Car High Off Track



This remarkable photograph was the result of a photographer's alertness during a race. Note the car high off the track, the other speedster beneath and the wheel which caused the crash

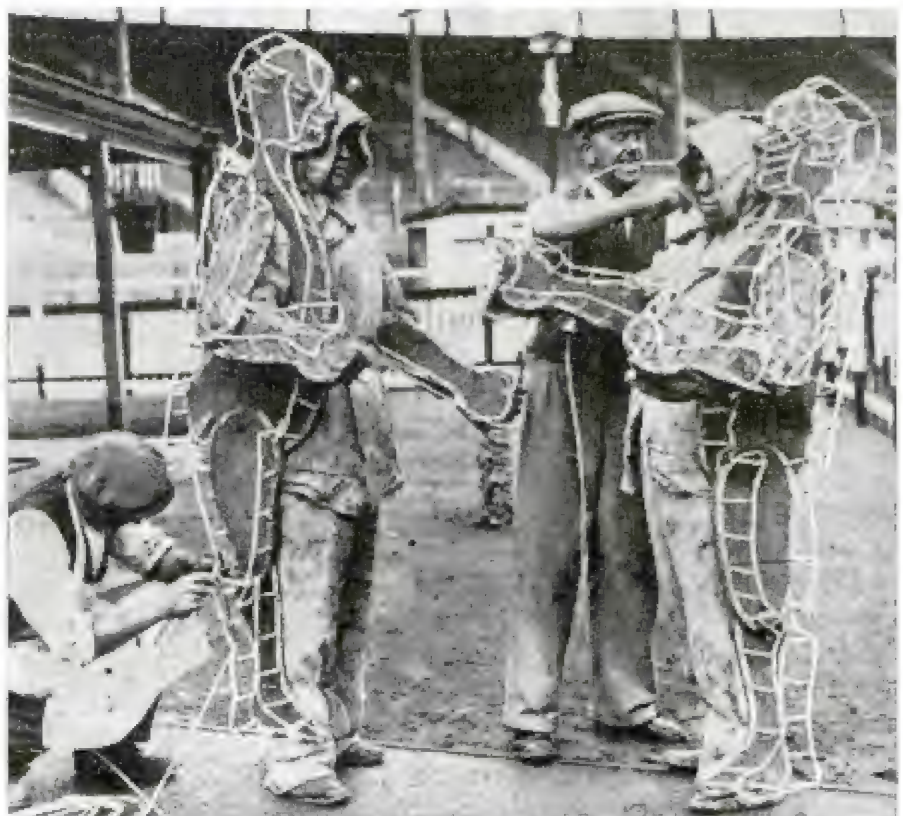
Snapped an instant after two racing cars crashed on an Indiana speedway, a picture made by an alert cameraman shows one of the autos high in the air, as though it were flying. The car, at the moment the camera

was snapped, was right side up with the driver still in his seat. Just beneath was the racing auto with which it had collided. Loss of a wheel caused the crash, which resulted in serious injury to both drivers.

'Human Fireworks' in Asbestos Lend Action to Display

Asbestos suits protect two men who supply action for a spectacular display in which fireworks attached to their costumes discharge. The "human fireworks" engage in a boxing pantomime as the fireworks paint their moving arms, legs and bodies in colored fire. The heavy asbestos suits are equipped with hoods for protecting their heads. Extraordinary endurance is necessary because the men spend several minutes inside the hot suits.

Overheating the domestic water supply is a destructive practice, for corrosion activity doubles with every ten-degree increase in temperature.



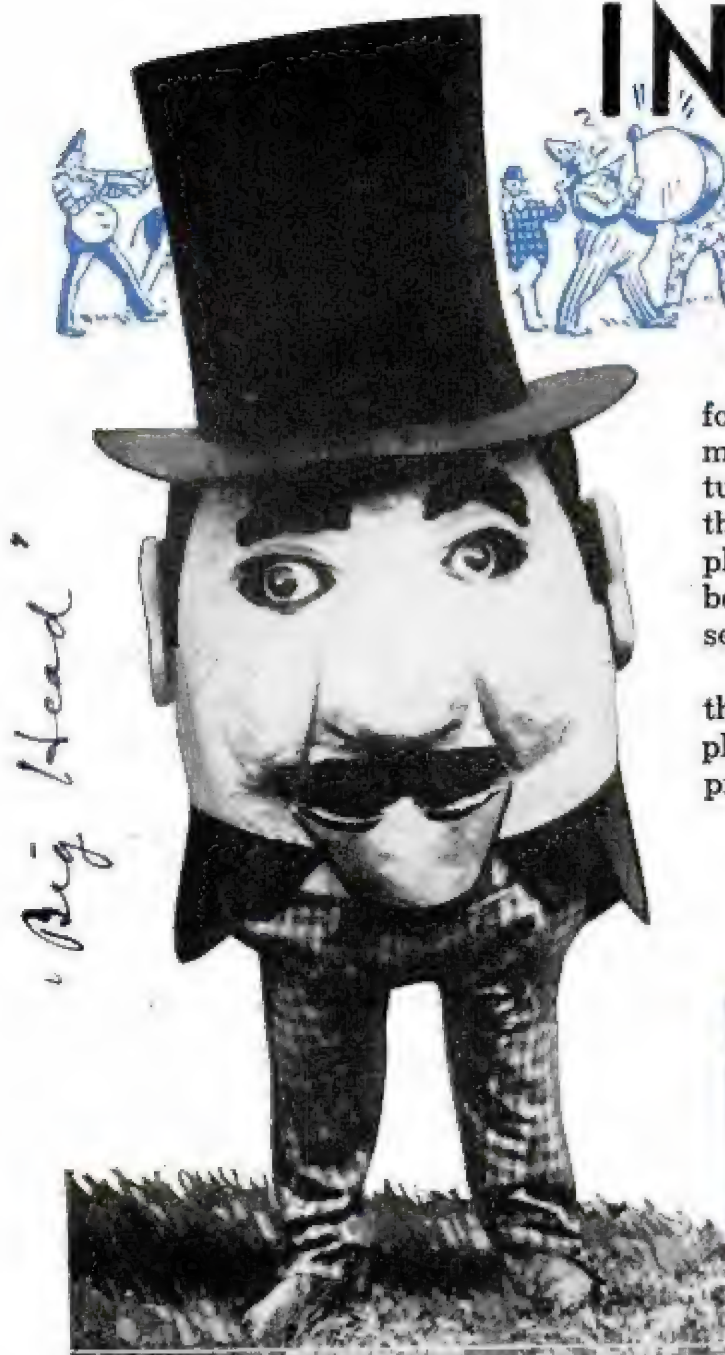
Preparing two "human fireworks" for scene in which the fiery outlines of boxers will go through a sparring exhibition

Richard from Buckensack & Co. White City Fireworks

American City

White City Fireworks

INVENTING



Big Head



Clowning today is serious business—at least for the clown. Time was when he depended mostly on pantomime and ridiculous costumes for laughs. But today it takes more than a preposterous pair of pants and a couple of awkward feet to tickle your funny bone. It takes ludicrous ideas—new ones each season—staged as one-man playlets.

Modern clowns put over these ideas with the aid of props, the stage settings for their playlets, and they depend on mirth-provoking props as much as on pantomime and dress to

A CIRCUS clown bursts into the arena, his every movement simulating terror. Clinging to the back of his costume is a “stuffed” goose with wildly flapping wings. Around the hippodrome track flees the funny man, the angry goose in his wake, hanging on with a bulldog grip.

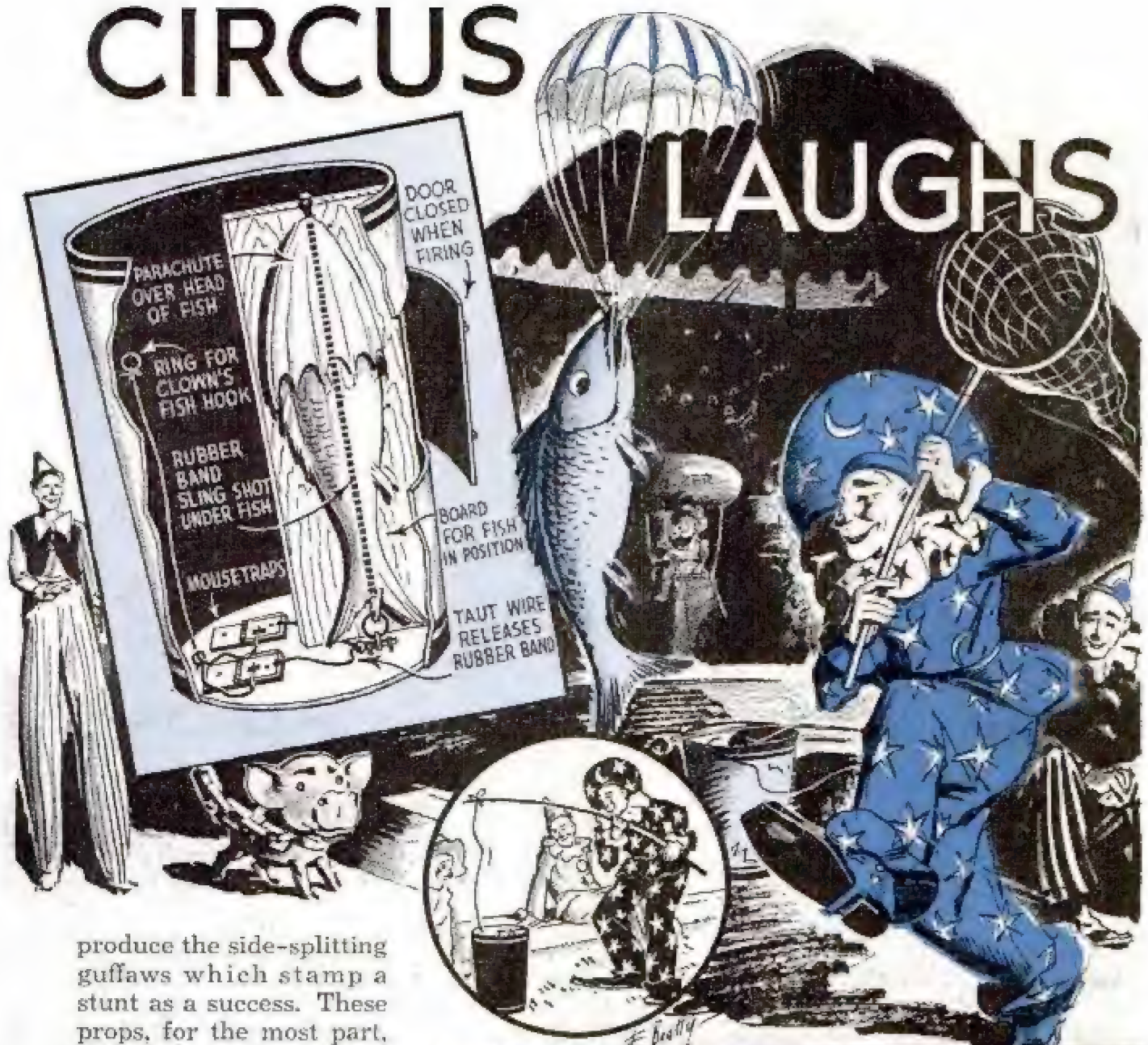
The crowd roars with laughter, partly at the antics of the clown, partly at the realistic appearance of the bird and partly at the whole ludicrous idea of a goose chasing a man. To the crowd, the “gag” seems something the clown thought up on the spur of the moment. Actually, it represents weeks of work, not by the clown, but by his “prop” man who “invented” the goose.



Top, a laugh-provoking oversize head for the clown's body. Bottom, “baby zep” rigged up by the “prop” man to amuse circus crowds

CIRCUS

LAUGHS



produce the side-splitting guffaws which stamp a stunt as a success. These props, for the most part, are the ingenious creations of amateur inventors, friends or acquaintances of the funny men who are handy with tools and who often spend weeks or even months fashioning some contrivance intended only to make people laugh.

Many of the prop men who construct the complicated apparatus used by clowns do the work as a hobby, and not as a profession. They receive their reward in listening to the roars of the circus crowds as their favorite clowns enter the arena



Top, diagram of the fishing prop. When the fish floats down on parachute, the clown catches it in the butterfly net. Bottom, left, putting on harness which holds the goose. Right, clown being "chased" by the goose. Harness supports the goose in pursuing position



with props of their own creation. One amateur inventor who spends most of his winter evenings constructing next season's props for his favorite clown is E. M. Aronson of Fort Scott, Kan.

When the circus came to town, Mr. Aronson, as a boy, paid scant heed to the lions and elephants and aerial artists. His eyes were all for the clowns. And when other boys boasted they expected to be lion tamers or bare-back riders, he said he would be a clown when he grew up. But he wasn't. Instead he became the proprietor of a drygoods store. He still went to circuses to see the clowns, however, and sometimes wished he might meet a real clown without the white paint and funny clothes.

And finally his dream came true. One day a quiet, unassuming man came into the store and asked for some very large hooks and eyes. Told that they were no longer in stock, he expressed regret, adding that he needed them for a clown wardrobe. "Are you a clown?" inquired the astonished Mr. Aronson, staring wide-eyed. "Wait just a minute. I think I have some of those big hooks and eyes in a storeroom upstairs."



Mr. Aronson's customer was Lew Hershey, contortionist and clown for more than thirty years. The hooks and eyes located, the merchant invited his visitor back by the old stove to chat and thus began a friendship that made of the storekeeper a clown's prop man. Eagerly the merchant who had spent fifty years in the same town, in the same business and in the same home, questioned Hershey about circus life, about his travels, about his profession. Next season Hershey came back for another visit.

"If I could only find someone handy with tools, I would have some good gags for next season," he remarked.

"I'm your man," responded Aronson. "I've got the tools in a workshop in my basement at home and I know how to use them. Bring on your ideas."

"Well, it's a hard one," replied the clown. "I



Top, Lew Hershey, veteran clown. Center, "What a Man" prop, with huge body and miniature head. Bottom, ridiculous-looking prop depicting the "retired clown"

don't think you can do it. I want a dirigible balloon supporting a high chair in which I sit, dressed as a baby, with dummy legs hanging over the front and my own legs concealed by a drape extending to the ground."

"How are you going to make a balloon stay in the air and support that chair?" demanded Aronson.

"That's your worry," replied Hershey with a grin. Then he added a few extra specifications. "The prop must be light in weight. It must be strong and durable. It must be waterproof. It must be



Top, Chinese laundry prop, with some of the washing hung out on the pigtail. Bottom, clown band of Al G. Barnes Circus, with Lew Hershey at extreme left

collapsible so it can be packed in a trunk."

"Anything else?" inquired the alarmed Mr. Aronson.

"Yes," added Hershey. "Paint 'Baby Zep' on the sides. That's the 'gag'."

Many times while designing that zep, Aronson wished he had stayed behind his ribbon counter and let clowns look out for themselves. But he kept at it. With the aid of geometry, he figured out the ellipse and designed a cigar-shaped dirigible thirty-eight inches long and sixteen inches in diameter. He constructed it in two halves, held together with clasps, saving

half the space in packing. He made a wire frame, covered it with screen wire and applied several coats of aluminum paint. He built a chair, bored four holes in it, inserted four perpendicular rods and attached the balloon to the rods. Out of wire he fashioned a pair of baby's legs, covered them with shoes and stockings and attached them to the front of the chair at the seat.

Then he constructed a harness for the clown's shoulders to support the chair, the seat of which was built so it fitted around

(Continued to page 126A)

Trailer Is Staff Headquarters of General when Army Travels



This trailer, complete with many comforts, serves as traveling staff headquarters for four army officers

"Tenting tonight" means a trailer to the modern army general. A well equipped trailer serves as traveling staff headquarters during army maneuvers, providing sleeping quarters for four officers. It has an independent lighting system, facilities for cooking and refrigeration, clothes closets, wash basins and other conveniences.

Blades Coiled in Safety Razor Like Motion-Picture Film

Coiled inside a new-type safety razor is a metal ribbon, somewhat resembling motion-picture film, on which there are 180 double-edged blades. The ribbon is



more than thirty feet long. It is coiled so that a quarter turn of a button on the side of the razor case projects the exact length of a new blade through a

slot in the non-shaving end. This length of blade is broken off and fitted into place beneath the safety guard, which is raised by pressing another button. When this button is released the guard snaps back into place and holds the blade firmly. The ribbon blade, which is extremely flexible,

is made possible by a process through which very thin chrome alloy steel, only .00315 inch thick, is made into ribbons. Automatic optical control during the grinding process assures uniformity of cutting edges. The last twelve blades in the case are marked with a blue line to remind the user to renew the ribbon. The razor, weighing less than four ounces, fits snugly into the hand.

Throat "Mike" for Pilot Reduces Hazards

Designed to reduce hazards of present large-size hand microphones, a small throat "mike" for pilots is under test. It consists of a necktie-like cord to which is attached a microphone about the size of a large button. This is held

by the cord against the throat to pick up vocal sound waves through the neck tissues. Interfering noises, such as roaring of engines, are reduced sharply and the pilot's



Throat microphone in place, leaving pilot's hands free for other duties

hands are left free for manipulating controls. In one accident, a hand microphone is believed to have dropped into the midst of the plane's controls, preventing their manipulation and resulting in a crash. The neck microphone is now in use in Italy and is being tested by the United States army.

Major General Walter P. Gray, commanding the 4th Cavalry, is 10 3/4 W. V. Air Force

es 948. near San Luis Obispo Calif

es 1040

es 1089

Mr. Karl Ernst Solingen-Audderhoe

No U.S. agent known

Chicago

Modeling Sheets Can Be Tooled Like Leather

Home craftsmen can make decorative and useful articles with a kit of modeling sheets which are tooled like leather. The same technique, the same tools are used but the material is less expensive than real leather. The kit includes an assortment of sheets, patterns, tools, paintbrush and water colors. The tooling is not difficult, and skill comes with practice. First the pattern is laid over the waxy top side of the modeling

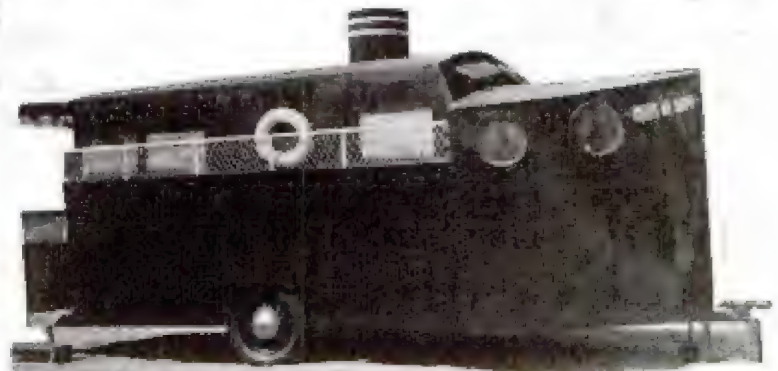


Above, two steps in use of the modeling sheets, which are tooled like leather. Below, a wastebasket, one of the many useful objects which can be made with aid of the kit

sheet, held in place with a paper clip and traced with a stylus. The back of the sheet is then moistened, the pattern traced more boldly, and then the design is raised or embossed with a flat modeling tool applied on the underside. Wastebaskets and lamp shades, picture frames, bookends, Christmas cards, desk sets, trays, nameplates, signs and relief maps are some of the articles adaptable to this tooling material.

Auto Trailer Built Like Yacht Has Water-Tank 'Funnel'

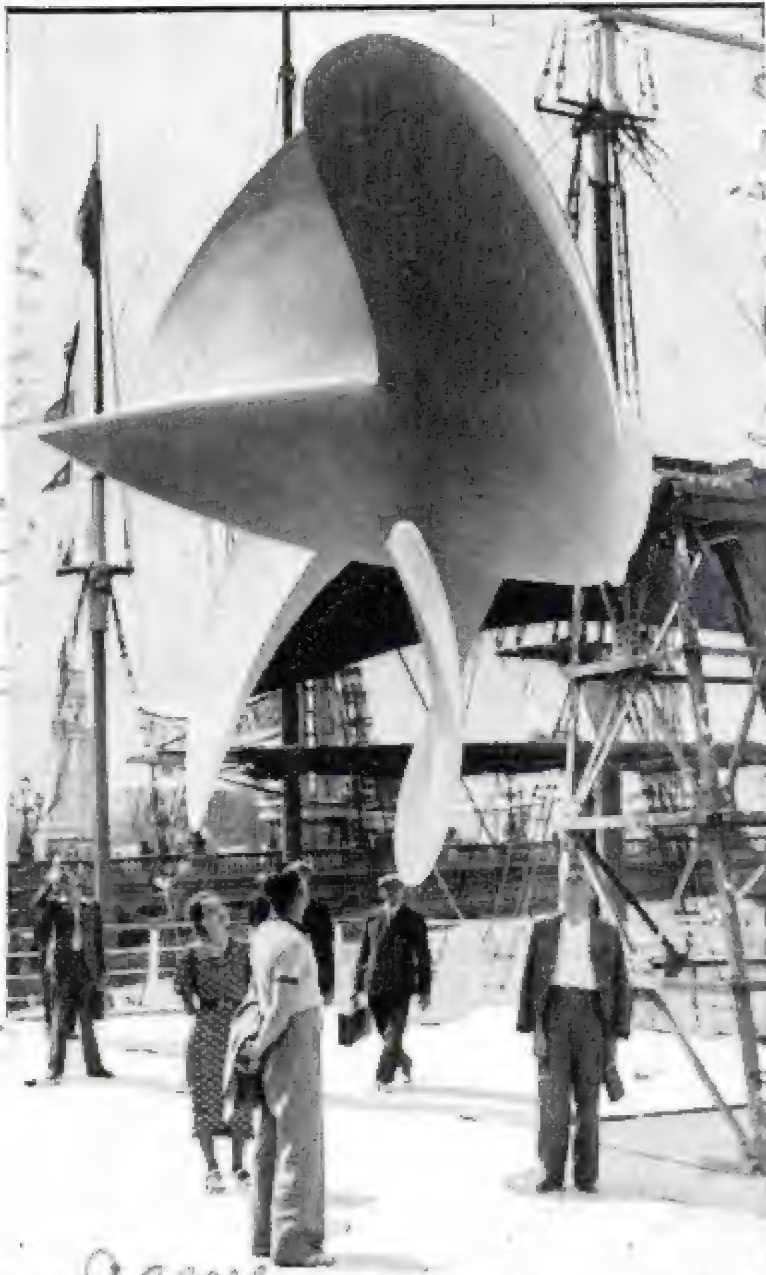
Closely resembling an ocean-going yacht, the latest auto trailer is complete to the funnel in which there is a twenty-six gallon water tank. It has portholes instead of windows, imitation life rings strapped to upper deck and a small after deck which serves as a porch. The interior is fitted up like that of a yacht and consists of a galley with stove and icebox and sleeping accommodations for six people.



Here is the land yacht, resembling a small cruiser but equipped with wheels to serve purposes of a trailer

Walter Miller, 1111 Drury

Giant Screw from 'Normandie' Is Shown at Paris Exposition



Here is one of the huge propellers which enabled the "Normandie" to win the transatlantic speed race

Memento of a historic race against time, one of the giant propellers of the French liner "Normandie" is on exhibition at the Paris exposition. After helping the big ship win the blue ribbon of the Atlantic, it was replaced by a new screw.

Fish Are Seasick on Boat

Fish which refused to escape when they had the chance because they were seasick—that's the kind of yarn brought back by scientific anglers. The men who vouch for the seasick fish—and they have the fish to

prove it—are on the staff of the Field Museum of Natural History in Chicago. They were angling for museum specimens off the coast of Maine in a high sea and kept their catch in a "live tank" alongside the power boat. As the intensity of the waves increased, the water washed over the live car in such a manner as to provide escape for the captives. But the fish were actually and visibly seasick and remained miserably in the bottom of the live tank, manifesting no interest in swimming to freedom. Later they were transferred to tubs on board the boat and continued to suffer from the motion until port was reached.

Three-Speed Wheel Chair Is Run by Batteries

With two fifteen-plate auto starter batteries for power, a motor-driven wheel chair travels forty miles or more at a speed of ten miles an hour without recharging. It costs only about twelve cents to charge the batteries. It has three speeds and reverse, direct front-wheel drive, an electric-welded steel frame, adjustable springs and jumbo tires on its three wheels.



This battery-powered wheel chair attains a top speed of ten miles per hour

Electro. Isaac Motor
44 Santa Clara

Comforts of Trailer Built into Rear of Car

Almost every convenience of the modern trailer has been built into the rear compartment of his seven-passenger car by Dr. C. D. Owens to relieve the tedium of long trips. The equipment, much of it constructed to his own design, folds or may be concealed so that the car presents a neat appearance when ready for day travel. At night



Several views of the car with interior rebuilt to give conveniences of trailer

the day lounge may be converted into double-decker beds for two persons, with steel rods to support the upper berth. Each bed has springs and comfortable mattress. Screens in the windows keep out insects. In the morning, the doctor turns on the faucet of a small basin and draws water from a hidden four-gallon tank for washing. Raising the top of the basin's

drainboard reveals a mirror for shaving and combing the hair. Then comes breakfast, prepared on a small gasoline stove which fits beneath the lower bed. A folding table, large enough for four, is set up across the lower end of the bed, and dishes and cutlery from a dish locker attached to the right-hand rear door are laid out. The driving and passenger seats at the front are both reversible, providing seats for meals or card game. One feature of the car is the well cut into the floor of the rear compartment to provide headroom for dressing or moving about. This well is on a level with the drive shaft, leaving ample clearance.

SUPER-TIRES *for the*

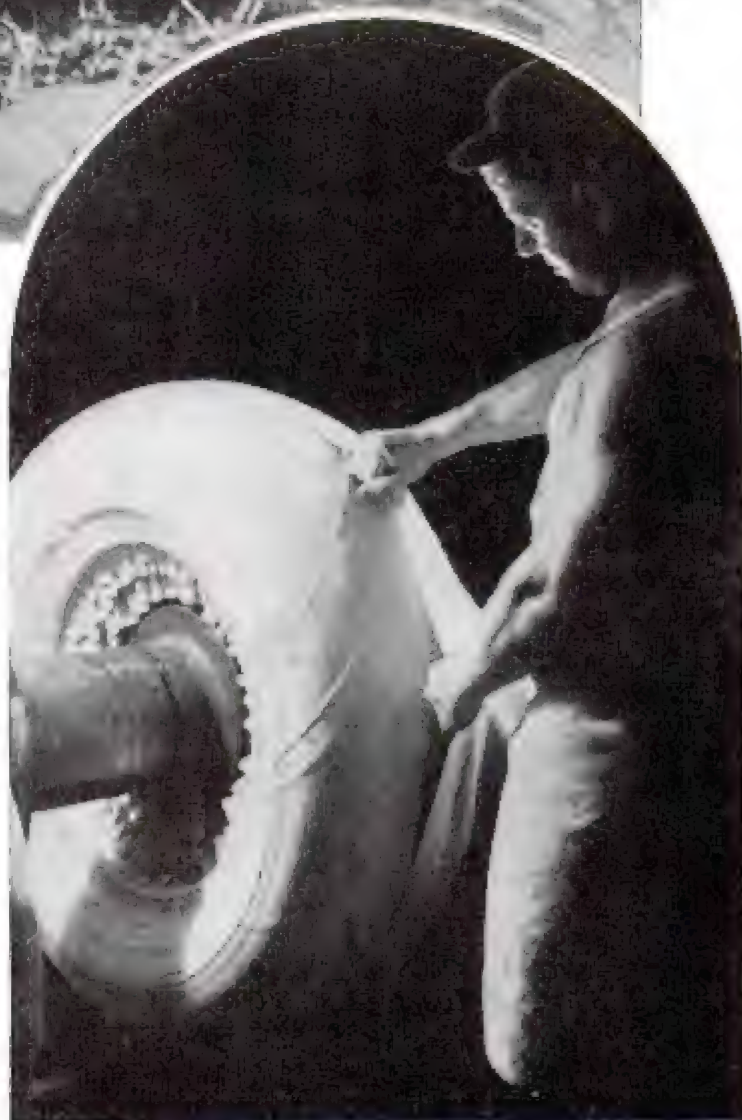


By Julian Leggett

ALMOST unbelievable mileage is being rolled up by a new tire designed especially for heavily loaded trucks and buses operating at sustained high speeds over long distances. Built to resist heat, the No. 1 enemy of rubber and fabric, this tire delivers from three to thirty times the mileage of ordinary tires—the harder the job, the greater the contrast.

Just recently one of these tires was retired from service after 140,636 miles on a fast truck hauling very heavy loads between Hamilton, Ohio, and Chicago, Ill. A nail hole caused removal of the first tire of the same set after it had traveled 120,000 miles and the other two tires delivered between 120,000 and 140,000 miles each before being declared unsafe.

This record is exceptional, but records of seventy, eighty and even one hundred thousand miles are being reported so frequently that makers of the tire and operators of the nation's motor freight and passenger lines regard the new product as



Top, Dodge's severe truck tests mean real punishment for the tires. Bottom, applying the fabric, one step in the building of a tire

HIGHWAY EXPRESS



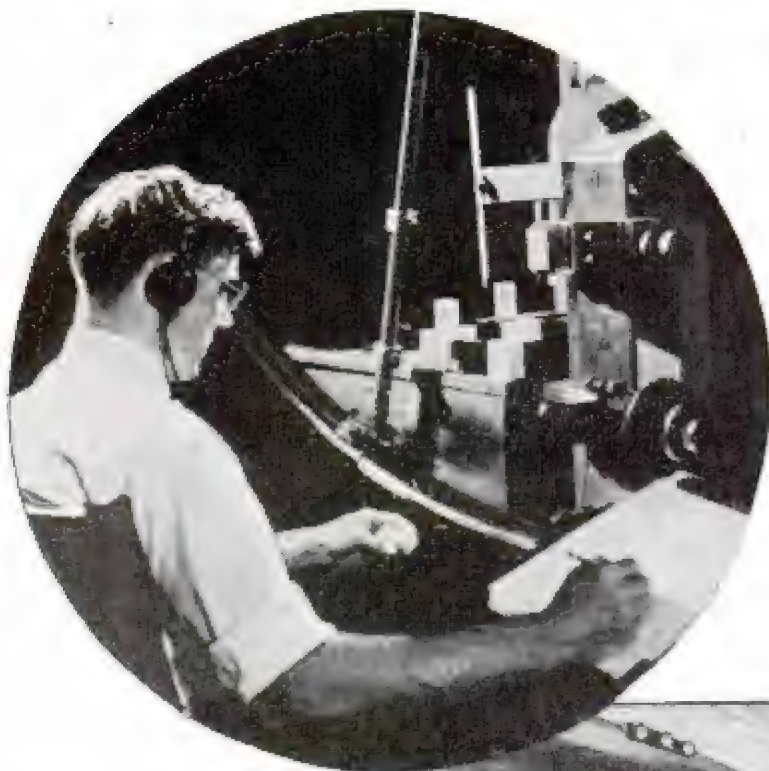
Courtesy Goodyear Tire & Rubber Co.

Here the tire experts are shown dissecting casings to find what makes them break down. Sometimes it takes years to trace the cause of failures, but the tire engineers never give up

a super-tire, the thing for which they have been searching for two decades.

Rayon, plus a patented secret process for bonding its silky smooth strands to rubber, is the secret of the tire which makes possible the operation of trucks and buses on limited train schedules. Repeated experiments, carried on over a period of

many years, revealed that rayon would retain its high tensile strength under severe heat and that it was a practical material for use in tire building. After those two facts were established, more experiments brought to light a method of twisting the rayon filaments into yarns and cords, and special new-type equipment now does



this job. Bonding the tough rubber compounds to the smooth rayon cord was another problem which was solved after many months of development of the secret process.

The completed rayon cord tire then was subjected to the most severe tests imaginable. On the Arizona desert trucks equipped with the super-tires, each loaded with 5,000 pounds, which represented a twenty-eight per cent overload for that size of tire, were driven twenty-one hours each day at fifty miles per hour. At the same time other trucks fitted with ordinary tires were operated at the same speed with the same load. With the temperature at eighty degrees, the conventional tire broke down at 6,000 miles; the rayon tire at 20,000 miles. With the heat at 106 degrees, the conventional tire stood up for only 600 miles; the other tire ran on for 18,000, thirty times as far.

Compared to the ordinary tire, the new product's rayon cords were revealed as possessing greater tensile strength in extreme heat; greater resistance to fatigue; better resistance to separation, and less tendency to generate destructive internal heat. At last the tire engineers placed their

approval on the new product, recommending it especially for "murder runs."

Murder run is descriptive of a truck or bus operation which calls for sustained high speeds with heavy loads over long distances. Sustained high speed means speed kept up for long distances, perhaps 100 miles, without stops. Under these conditions, the tires are given no chance to cool off, no chance to dissipate the intense internal heat built up by the constant flexing of the sidewall cords under the heavy load and the high speed. Frequently the heat inside a tire used on murder runs reaches

250 degrees, simply burning up the cotton cords and causing them to lose their tensile strength, quickly resulting in a blowout.

Not long ago, but before the rayon cord tire was created, a heavily loaded truck was speeding along a Texas highway, blistering heat waves beating against the



Top, machine flexing sample rubber to determine its resiliency. Center, high-speed truck. Bottom, super-tire after 140,636 miles of hard service, a record hitherto regarded as impossible.

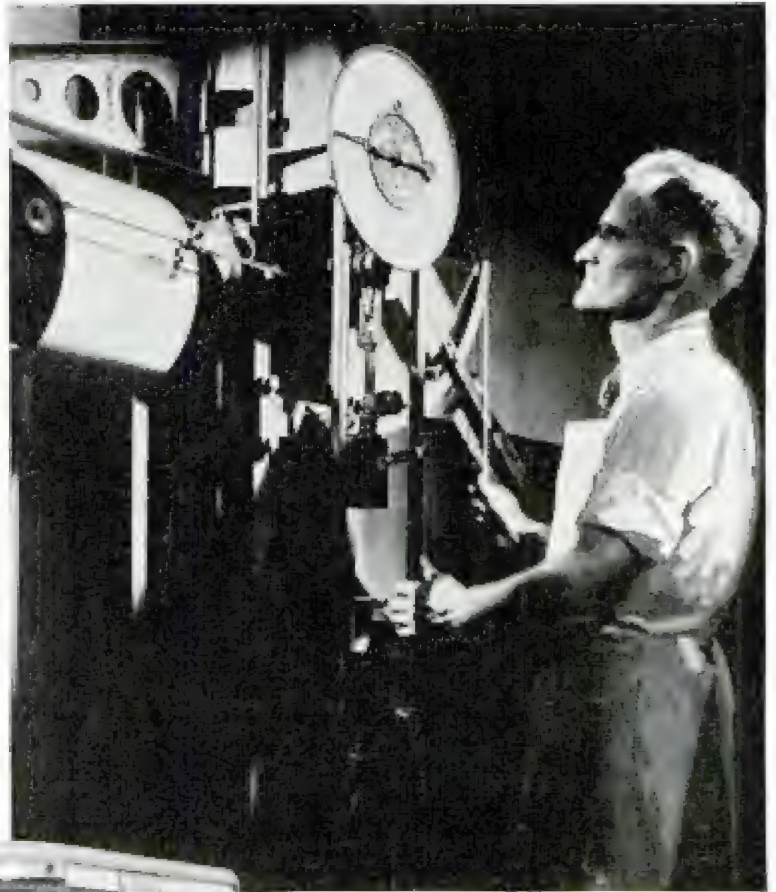
Bentley White
El. White Bros

cab. Inside, the perspiring driver pressed the accelerator with heavy foot and wrestled with the wheel; fighting against time to reach the terminal. Many miles lay ahead and his load was scheduled for delivery that night.

"Looks like we might make it," his helper spoke up and then qualified his prediction, "if those tires don't blow."

Punctuating his last word came a loud "bang!" Both groaned as the driver fought the swerving truck to a standstill beside the road and his helper turned wearily to haul out a spare tire. It was the left rear, a big hole gaping at the edge of the tread.

"That's the fourth one this week," the driver commented bit-



terly, "and this one's been on the wheel only three or four thousand miles. This heat breaks 'em down in a hurry. Just touch that casing. It's murder to put a tire on this truck and run it fifty miles an hour with such a heavy load on a hot day like this."

"Yeah," his helper replied as he touched the hot casing and hurriedly snatched away his hand, "and run it 300 miles without stopping long enough for it to cool off."

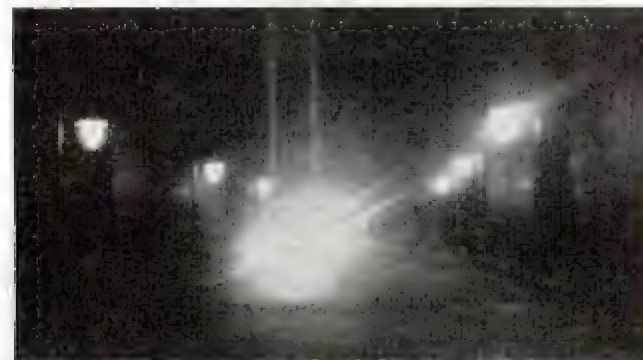
Both knew that they could not arrive on time. And that meant complaints from shippers, perhaps loss of the fast-run business and

(Continued to page 164A)



Top, testing bead wire for tires. Sample wire writes its own record on drum at left. Center, heavily loaded truck on the highway. Bottom, cross-section of a truck tire. Note the many layers of fabric necessary to give the tire great strength.

Improved Street Lighting Reduces Accidents



On thirty-one miles of streets in Detroit, improved lighting has reduced the number of fatal traffic accidents. There were 146 night fatalities and twenty-one day fatalities on the same streets in 1934, 1935 and part of 1936, or about seven times as many night accidents as day. Since the new lighting has been in operation, the ratio has been reduced to 1.25 to one, only five night fatalities and four day fatalities be-

Top, street with new lighting. Strip, top, model in which tests were made. Center, how car lights appear on well-lighted street. Bottom, glaring effect on poorly lighted street

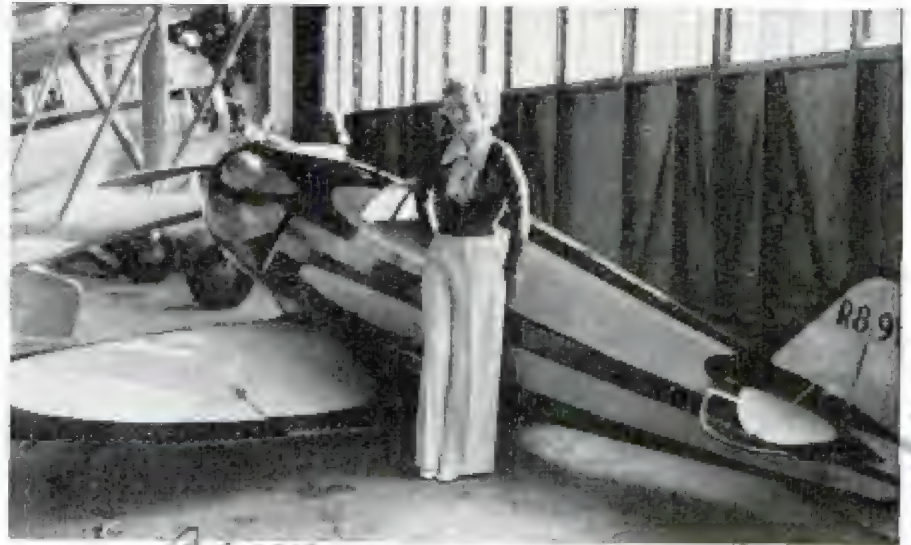
ing reported in the four to eight months that the system has been operating in some sections. Lighting along the thirty-one miles of streets has been increased from two to five times what it was. Reflectors of the luminaire-type lamps are arranged to produce even pavement brightness, and auto drivers are relieved of objectionable glare. In order to study the effect of auto headlight glare and its relation to street lighting a miniature street was built, on a forty to one scale. Inclosed to simulate darkness, the model represented 500 feet of a sixty-foot city street with street lights spaced 100 feet apart. Miniature cars were equipped with miniature lamps and camera lenses. The lighting was focused on an observation point to simulate the effect of bright headlights. The observation point was outside the inclosure and corresponded to the seated oncoming driver in the center of his driving lane. Both street-lighting intensities and headlight intensities were adjustable so that any conditions could be duplicated on the model. The tests on 100 drivers revealed that auto headlight glare is variable, that what is

Gmt. L. J. Schrenck General Supt.

Island River, Ariz. Detroit.

Speedy "Vest Pocket" Plane Not Much Bigger than Pilot

glare to one driver is far from glare to another. Twenty drivers could tolerate three times the intensity and still see with the same acuity as another twenty. It also was found that the older the person, the more glare affects him. But outstanding was the finding that there is a definite relationship between auto headlamp glare, street lighting and visibility. For every value of oncoming headlight intensity there is a corresponding intensity of street lighting to provide a definite visibility. As oncoming headlights are increased in intensity, as is happening with each year's new cars, street lighting must be increased to keep the same visibility. As a general rule, in order to provide the same visibility for the auto driver and use depressed beams, two to three times the street-lighting intensity is required as when using parking lights. When bright headlights are used, five to six times the street-lighting intensity is necessary as when the auto's parking lights are used. To give the oncoming motorist the greatest visibility and the full benefit of street lighting, drivers should dim their headlights to a point where glare is not a factor under practical driving conditions.

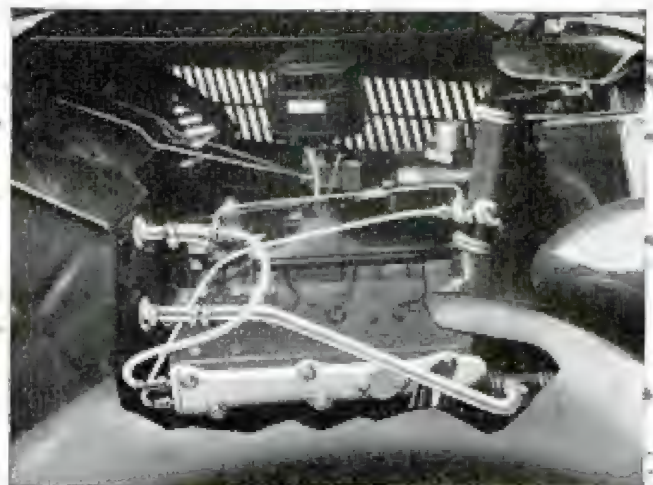


This photograph of the latest midget airplane shows that the tiny ship is hardly larger than the human figure standing beside it

Airplanes can't be built much smaller than the "vest pocket" edition specially built in a California aircraft factory. Big enough to carry an average sized man, it is actually not much larger than its pilot. The wing spread is only eight feet, and it is ten feet long. A seven-cylinder ninety-horsepower motor drives the little ship 220 miles an hour.

Steam Vapor for Car Heater Supplied by Simple Unit

Designed to be attached to car heaters now in use, a new unit injects vaporized steam instead of hot water into the heater. It is claimed that vaporized steam improves the efficiency of the hot-water heater.



Steam vapor apparatus installed on auto

Faucet with a Double Outlet Is Also Drinking Fountain



Plug the outlet of a new type water faucet and it becomes a drinking fountain. This bubbler for the home or office has a hole in the top of the spigot. When you want to drink,

you merely turn on the water and hold a finger at the outlet, forcing the water up through the hole.

Crane Co. 836

Automatic Spading Fork Saves Work in Garden



Handy spading fork has many purposes, as this demonstration in Paris shows

Back-breaking work of spading up the garden may be reduced sharply by use of an automatic fork introduced recently in Paris. The fork has a base with hinge arrangement which enables the user to lift a load of dirt from the ground simply by pushing downward on the handle. Turning the dirt to one side may be accomplished at the same time by operating a lever. As the work progresses, the garden tool is pushed along the ground on its base.

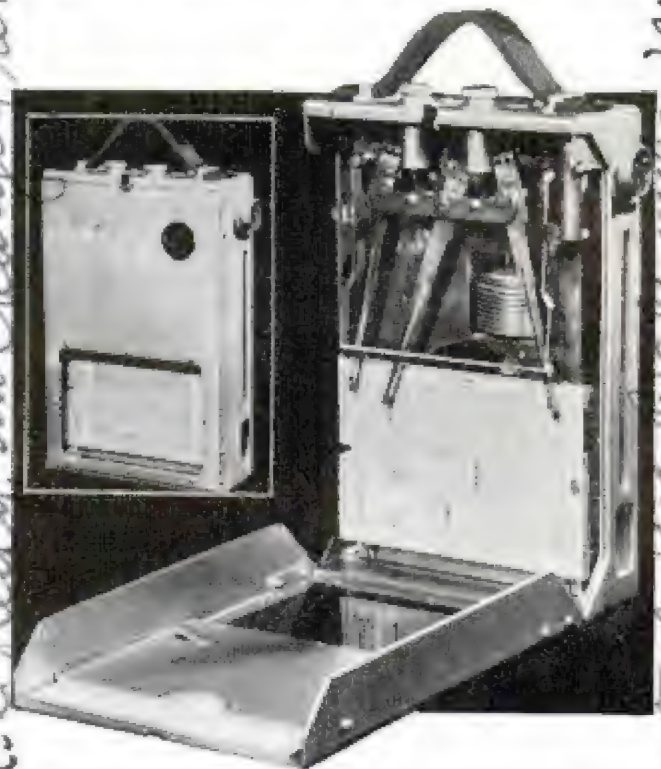
Coldest "Ice" Is Made of Carbon Frozen Near Absolute Zero

Man's closest approach to the frontier of absolute zero is carbon "ice," frozen to 446 degrees below zero Fahrenheit in the laboratories of Massachusetts Institute of Technology. Absolute zero, at which theoretically matter would vanish, is estimated at 459.6 degrees below zero Fahrenheit. Carbon is used in gas masks because of its "adsorption" power; gas particles adhere

to it. Chemists call this energy of attraction the "heat" of adsorption. The scientists froze carbon in liquid gases—hydrogen, helium, air—and, reasoning that there was still the heat of adsorption present causing the carbon to stick to the gases, pumped off the adsorbed liquid and freed the frozen carbon from this heat. Carbon frozen in liquid hydrogen to nearly 400 degrees below zero dropped thirty-six degrees further when freed of hydrogen. With liquid helium, carbon was cooled to 446.8 degrees below zero.

Flight Analyzer on Air Liner Writes Log of Trip

Checking up on both pilot and plane from the moment of takeoff to the landing, a "flight analyzer" writes an automatic log on every trip of a United Air Lines transport. Like a robot secretary that is always on the job, it records on a three-by-five inch chart the rate of climb after the takeoff, the altitudes flown throughout the trip, the time elapsed, the rate of descent on landing, the length of time the ship was controlled by its automatic pilot, the comparative smoothness of flight at cruising elevations, and the number and time of radio telephone reports made by the plane to ground stations. At the end of the trip



Flight analyzer for airplanes is contained in this metal carrying case

Dr. H. J. Perry

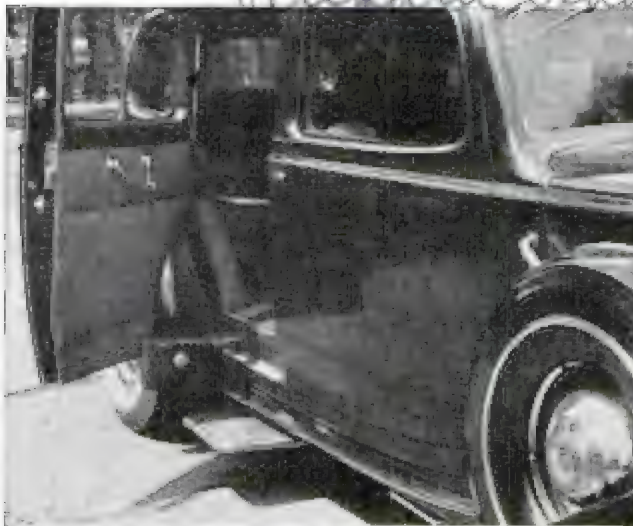
Washed out with
Julien P. Fryer Co

Armstrong Co.
Penna. Ave.
Pittsburgh Pa.

this record is delivered to the chief dispatcher of the sky line, who analyzes it and reconstructs the performance of plane and pilot. The instrument is housed in a duralumin case weighing three pounds. It consists of a barograph, clock mechanism, recording arms actuated by electrical impulses which record use of the automatic pilot and radio, recording pen and chart.

Vanishing Step on Armored Car Slides in When Door Is Shut

When government officials of Honduras ride in the armored car just built for them, they can feel pretty safe from assassins—even from bombers. The car carries 2,050 pounds of armor plate and laminated safety glass above its normal weight, and ninety per cent of the armor is built into the bottom of the car to protect it from bombs thrown beneath it. Five-ply glass windows one and one-fourth inch thick would shield the occupants from bullets shot from regulation army rifles at 2,700 feet per second. A special innovation in

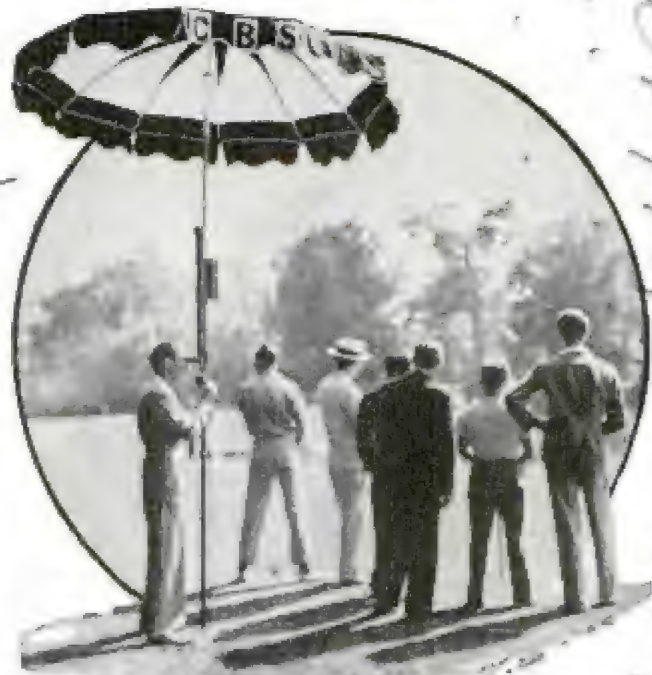


Showing the step on armored car which is visible only when the door is open

this car is the small, disappearing running board which, by means of a rod and spring arrangement, slides out of sight beneath the car when the door closes. This is to prevent attackers from boarding the car and firing at its passengers as did the assassins of King Alexander of Yugoslavia.

X-ray pictures on movie film have been developed in Germany by using a special lens and sixteen X-ray tubes, and production of sound X-ray films is now planned.

Periscope "Mike" Enables Announcer to See Game

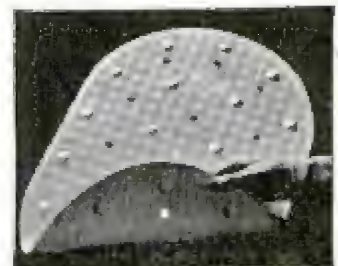


Here the announcer is looking over spectators' heads with periscope-microphone

Radio reporters covering a big golf match have their difficulties. If they edge into the "gallery" of spectators in order to see the play, their talking into the microphone may disturb the golfers. If they don't, they cannot see the shots well enough to describe them for the radio audience. A radio official solved the problem by inventing a combination of periscope and microphone mounted on the post of a big sunshade. The periscope sees over the crowd and magnifies the scene ten times so that the reporter can watch the play from a distance and tell the story to the "mike."

Bath Mat with Vacuum Cups Prevents Slipping

Suction cups are molded into the fabric of a bath mat to prevent it from slipping even on the wet surface of the tub. Its gripping power is doubled by its dual-cup design, one vacuum cup being molded within another.



Dept. of Public
Lecture
White
all the
Columbian
1220
Maple Ave.
Boston Co. Clm
1220

Surgeon Genl. University

MODERN MAGIC of the



Top, scientists check spectrograph built for Maj. Albert Stevens' stratosphere flight. Bottom, testing binocular prisms with an optical flat to determine accuracy of their surfaces

By Everett W. Melson

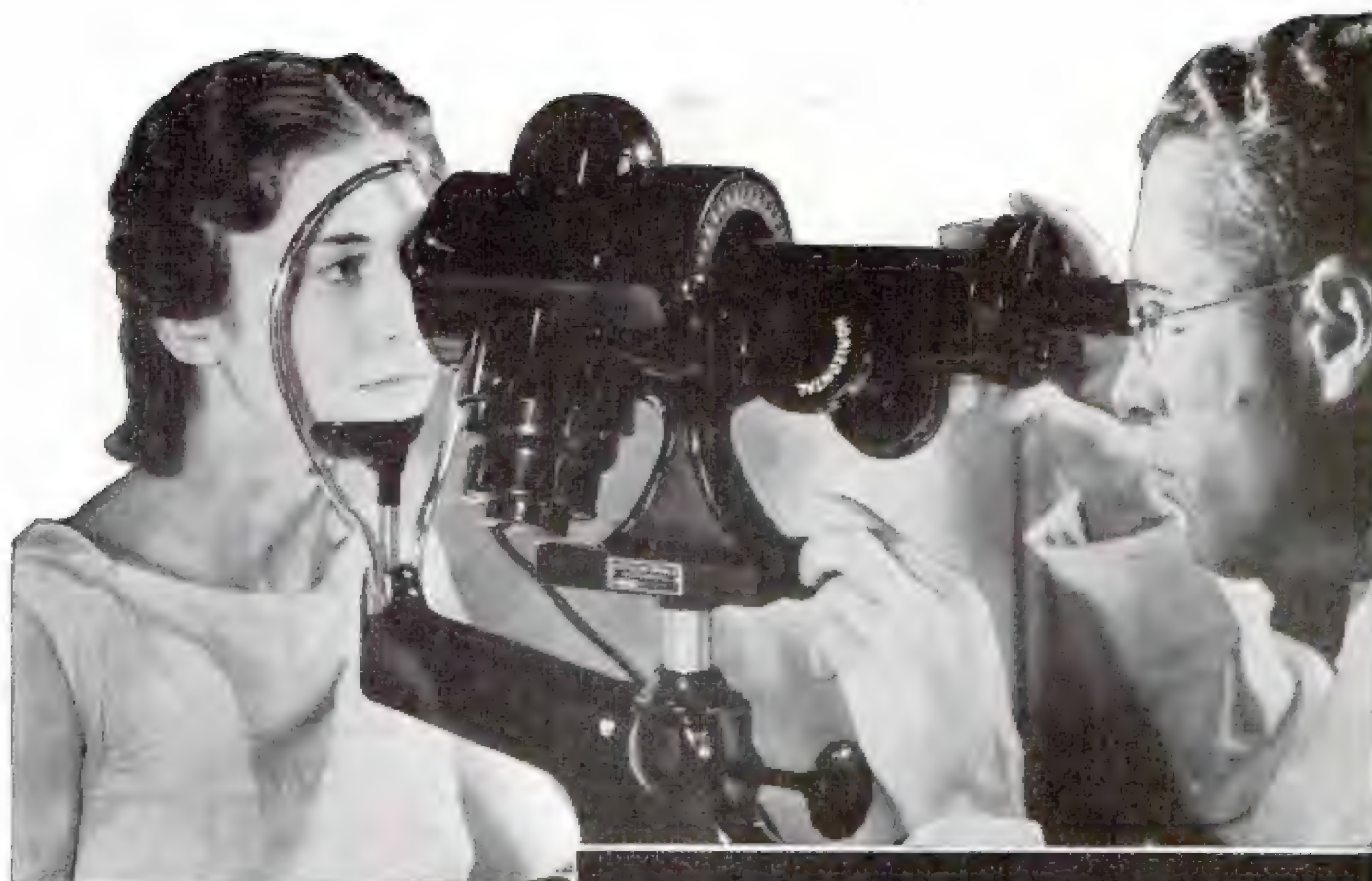
Bausch and Lomb

THERE was a frantic hunt one day in the grinding room of a great optical factory. A valuable lens had vanished—stolen, most likely, for men who spend months grinding a lens do not mislay it carelessly.

They found the culprit at last. It was no light-fingered sneak thief. It was an ordinary housefly. That polished crumb of glass, a perfect hemisphere no larger than the head of a pin, had been carried off on the feet of a fly, sticky with the wax used to hold the lens to the grinding spindle.

Imagine, if you can, the skill that goes into shaping a lens so small it can stow away on a fly's foot and so precisely polished that it is within six ten-millionths

of an inch of absolute accuracy. If that is the baby among lenses, the titan is that seventeen-foot reflecting lens which, perhaps three years from now, will be focusing into the eyes of human observers on Mt. Palomar, Calif., the light from stars six sextillion miles away. One is a twenty-

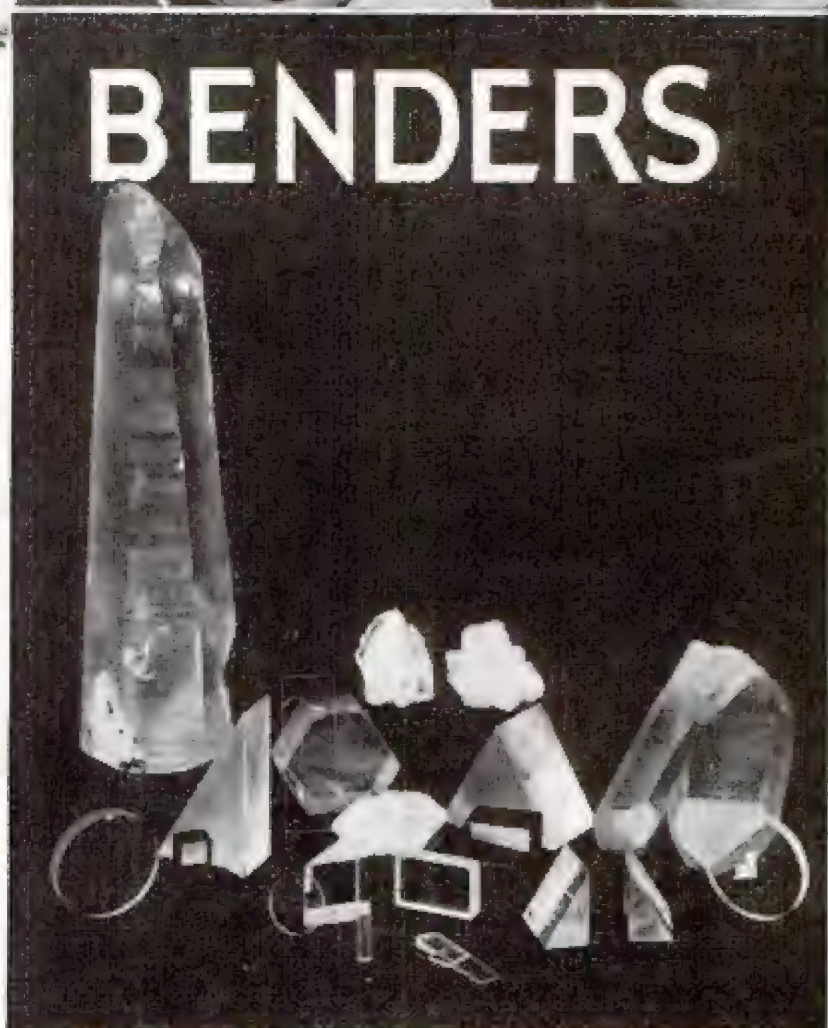


LIGHT BENDERS

ton glass mirror into which, if this were a flat and cloudless world, you might gaze from a California mountaintop and recognize friends on board a liner off New York harbor. The other is a microscope lens that magnifies a minute sea animal no bigger than a needle's point into an image the size of a trout.

Those two lenses are as different as the diatom under the microscope is from the distant nebulae caught in the 200-inch concave looking glass. Yet they are essentially the same, marvels devised by man to bend light to his will. Without these light benders the world of today would revert to the world of medieval days.

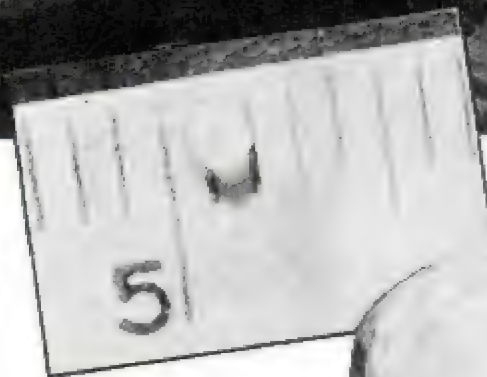
Possibly the fastest in the world is the photographic lens just completed, which takes pictures of light rays that left



Top, heratometer, which is a precision instrument for measuring the curvature of the cornea. Bottom, hexagonal quartz crystal in original state and a group of parts for precision optical instruments which were made from this natural crystal



Top, centering photographic lens. Center, magnified view of tiny lens on millimeter rule. Bottom, Elmer Cronk, who has spent fifty-six years grinding tiny lenses



distant stars before dinosaurs trod the earth. Its speed is $f0.59$, six and one-half times the speed of the $f1.5$ lens used in the fastest candid camera. In conjunction with the hundred-inch reflector in Mt. Wilson Observatory, the new lens designed by Dr. Wilbur B. Rayton of the Bausch & Lomb Optical company has photographed the spectra of nebulae 30,000 times fainter than the dimmest star visible to the unaided human eye.

Picture to yourself a world without the optical lens. You may be one of the three persons in every ten who do not need to wear glasses. You are lucky, and your vision would not suffer in a world without spectacles. But look at your magazine and your newspaper. No photographs! No pictures without a camera lens, of course. Movie houses would be closed, medical science would be helpless, chemists and jewelers and metallurgists would be set back centuries. Dentists would have to grope blindly in your mouth without the aid of optical mirrors. Bacteria again would be an invisible enemy. War could be fought, but without the accuracy of the range finder that enables a gunner to spot a

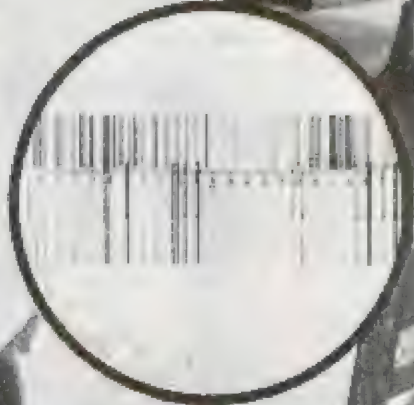
target 50,000 yards away. And the day of speed would end, for it is only through microscopic and spectroscopic studies of metals that engineers have been able to develop alloys capable of taking the punishment imposed on the engine and wings and propeller of an airplane boring through air at five miles a minute, on the axles of a million-pound streamline train booming over the rails at 100 miles an hour, or on the drive shaft of a racing car covering a measured mile on hard sand in a matter of a few seconds.

Optical glass is listed as one of the twenty-three vital raw materials



in time of war. War or peace, it is one of the most vital elements for scientific progress, even for life itself.

Until 1917, all optical glass was made in Europe, and when the United States entered the world war this country had nearly exhausted its supply of glass. But William Bausch had seen the need and had



Optical glass is as different from ordinary glass as the thoroughbred race horse from the plug or the steel of a fine watch spring from the steel of a nail. If it is to twist and bend light rays with a precision that can be measured only in wave lengths of light—and there are approximately 50,000 waves

(Continued to page 160A)

Concrete Umbrella Shades Cop from Broiling India Sun



This big traffic umbrella made of concrete helps the policeman keep cool

Being a traffic cop in India is a hot assignment under the best of circumstances, but the police in Bombay derive some comfort from the shade of concrete umbrellas. These big mushrooms are on safety islands in the middle of the street.

Daylight-Loading Film Container for Miniature Cameras



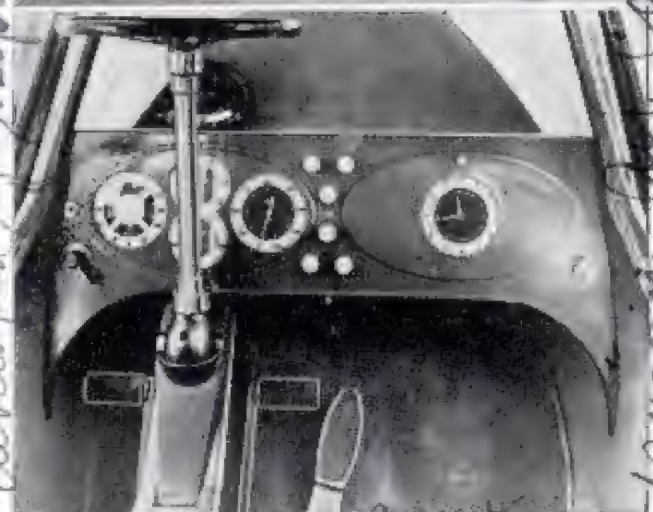
Miniature camera magazines can be loaded and unloaded in broad daylight by using a film container now available. To unload exposed film the magazine is placed in the open container

and the end of the film is drawn from the magazine, threaded through a light trap and engaged by a receiving spool in a light-tight compartment. When the film

container is closed, the exposed film can be unwound from its magazine and loaded on the container spool without fogging. To reload the magazine, new film is drawn from another spool in the container, which holds fifty feet of thirty-five millimeter film. Only about three inches of the film end are exposed in the transfer.

Plane Controlled Like Auto Speeds Amateur Flying

With its controls closely resembling those of an automobile, a new biplane tested recently is said to be easy for the amateur flyer to handle. It has safety features such as the tricycle landing gear and simplified controls. The wheel, like that of a car, is the plane's steering apparatus, directing air turns and governing ascent and descent. A pedal at the right of the wheel controls the gasoline flow, serving the same purpose as the automobile accelerator. The plane has a maximum speed of 120 miles per hour and a cruising speed of 109 miles per hour. The wing span is twenty-four feet and the plane's length is sixteen feet. Space is provided for pilot and one passenger.



Top, the new plane. Bottom, controls like those of an auto make it easy to fly

*Es 106
Cydric/Kemp-10853
Landed by
noted Hollywood*

developed by Joseph E. Swann Jr.

Swann Air Car Co. 777

*Buffalo Air Car Co.
(Buffalo, N.Y.)*

Special Tires Increase Farm Tractors' Power

Providing the means for increasing traction, special tread tires are being produced for farm tractors to improve power. One tread, recently developed by the Good-year Tire and Rubber company, closely resembles the lugs on steel wheels with which many tractors are equipped for work in mud, wet clay and gumbo. The high rubber cleats make the tractor unusually sure-footed in mud, enabling the farmer to work wet and sticky soil. At the same time, this tire makes it possible for the tractor to be operated on paved highways without damaging the surface. In many states, tractors with steel wheels and lugs are barred from the paved roads because of this damage. Another special tread tire is designed for tractors working in sand, loam and other loose soil. A third is especially suited to cane and rice fields.

Top and bottom, special tread tires on farm machines. Inset, latest tread for working in mud



Motor Roller Is Built of Auto Parts Found in Junk Piles



© Photopress

Junked automobiles furnished the material for a homemade motorized roller. Its engine was that of a midget automobile, its chassis and gearbox came from old cars. For rollers, an old gas tank was cut into lengths and filled with cement. The steering controls also came from a dump. The roller weighs about 2,500 pounds.

Whenever you find that you wish to know more about any article in this magazine, write our Bureau of Information, inclosing return postage.

Film Staff Dressed in Black to Control Lighting



© Paramount Pictures

Black coverings for staff prevents odd light effects from appearing in movie

To prevent light reflections from spoiling movies in the making, directors and their assistants frequently cloak themselves in black. This eliminates reflection of light from their white shirts and light trousers, particularly in scenes where a mirror is used by a player. In one scene for "Angel," in which the leading woman uses a mirror, Ernst Lubitch, director, and his cameramen donned black velvet drapes.

Motorcycle Speaker System Aids Traffic Safety

As a means of promoting traffic safety, a motorcycle of the Lincoln, Neb., police department has been equipped with a pub-



Safety motorcycle, with speaker system, enables officer to control traffic better

lic-address system. Used in the congested business district, it enables the traffic officer to warn pedestrians crossing the street against the lights, to clear streets of cars attempting to park double, to speed up or slow down traffic and to warn drivers of minor violations of regulations. His voice can be heard clearly over a distance of one block. The safety cycle is equipped with the usual police radio receiver, two dynamic speakers and an amplifier for public-address work. An advantage is the ease with which the cycle can move in traffic. Traffic enforcement is made easier with the officer in the open than if he were in a car fitted with similar equipment.

Tinning Any Metal Made Easy with Special Cleaning Flux

Cleaning and tinning in one operation, a flux recently introduced makes it possible to tin any metal including aluminum and cast iron, preparatory to applying solder. It is a granular flux and is applied with a wad of steel wool to a metal surface preheated to 450 degrees Fahrenheit. When

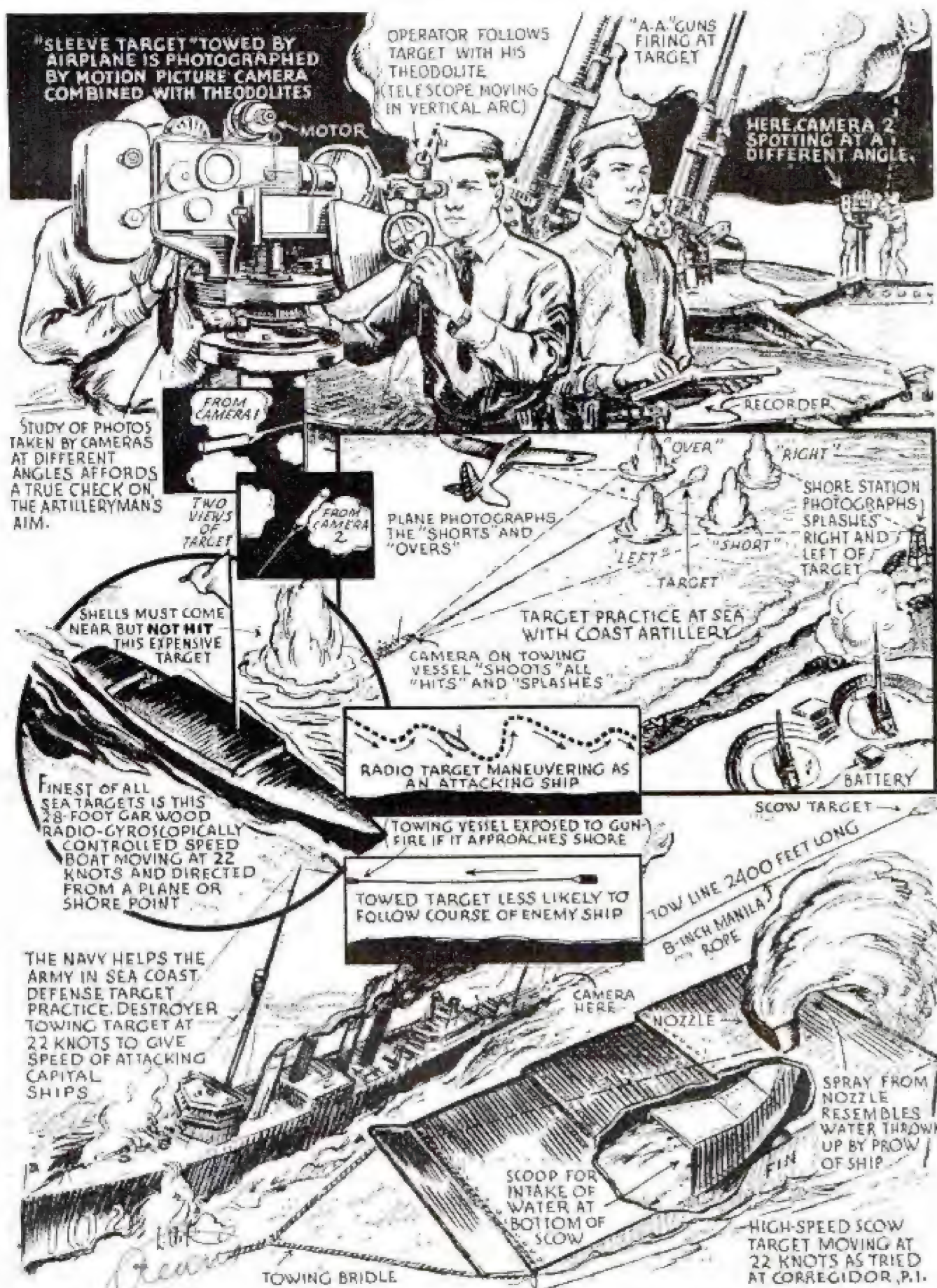


Tinning on auto is made easy with steel wool and a new granular flux

the wool is rubbed on the surface it removes film by both chemical and mechanical action, and thus a piece of rusty iron or steel can be tinned without previous cleaning, making the flux particularly useful in automobile body work. It is also suitable for general soldering work, for tinning bearings for rebabbiting and for repairing cracks in iron castings. One of the main ingredients of the new compound is pure tin in granular form.

K. F. Portier, Akron

Cameras Help Coast Artillery Improve Aim



Sketches of cameras devised by Major A. M. Jackson in use for spotting "hits" and "misses" of U. S. coast artillery in practice gunnery on air and sea targets. The cameras help the gunners to improve their aim, since photos of each shot reveal corrections necessary to increase the number of hits

145 W. 45 St New York



SNOW-

Top, typical week-end group at Badger Pass ski house. Left, skiers getting lift to hilltop

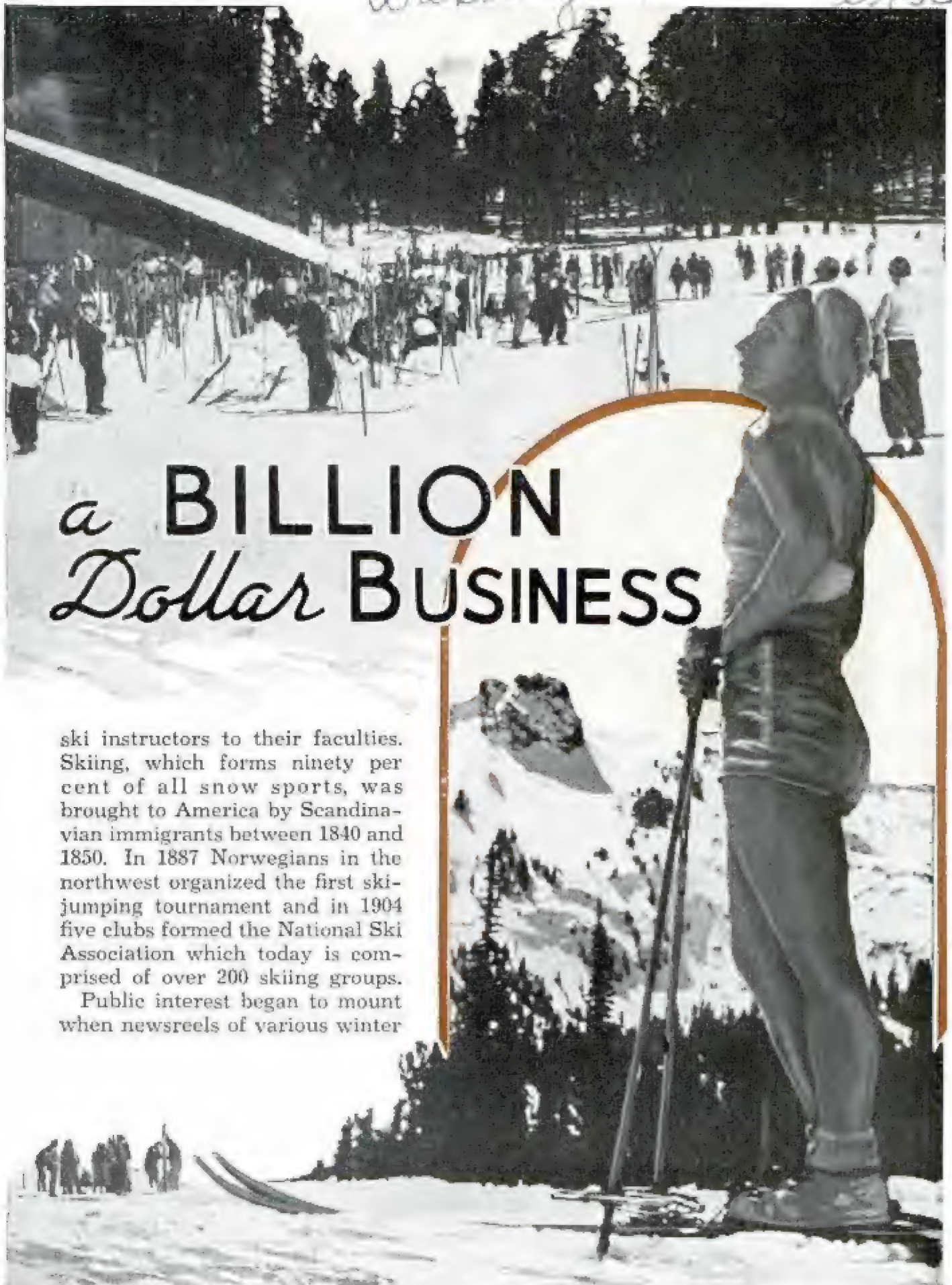
yearly, exclusive of the capital investment in factories for snow equipment, winter sport clothes and hotel resorts.

Winter vacations are making serious inroads upon summer vacations, swarms of city people traveling to deep snow for week ends on skis and snowshoes. To meet this demand, old hotels have been remodeled. Small mountain towns and re-

sorts which used to hole up for the winter now keep snowplows busy so that cash registers will keep ringing. In larger cities and towns, merchants enjoy a profitable business in skis, snowshoes, toboggans and sundry accessories. People discuss ski technique with the seriousness of politics and golf. Colleges which are within traveling distance of snow country have added

TO CHILDREN in the northern states the first snow means snowballs, snow forts and snow men. To their elders it means cough lozenges, extra handkerchiefs and mustard baths; and to makers and dealers in rubber footwear, sleds, scarfs, gloves and mittens, it means harvest time. Snow means business, a business which can only be estimated at a billion dollars

Center. Cedar in the North
Woodley Park Towers
Washington, D.C. 2053



a BILLION Dollar BUSINESS

ski instructors to their faculties. Skiing, which forms ninety per cent of all snow sports, was brought to America by Scandinavian immigrants between 1840 and 1850. In 1887 Norwegians in the northwest organized the first ski-jumping tournament and in 1904 five clubs formed the National Ski Association which today is comprised of over 200 skiing groups.

Public interest began to mount when newsreels of various winter

In spite of the wintry appearance of scene at the right, the skier clad in bathing costume experiences no discomfort on the sunny side of Mount Rainier. The sun's rays counteract the cold



Mt. Rainier

Top, looking over incline before starting the drop.
Left, railroad snowplow almost buried in drifts



sports-meets were shown in the nation's movie houses. Then the 1932 Winter Olympics at Lake Placid, the 1936 Winter Olympics at Garmisch-Partenkirchen, Germany, pictures of Americans at Lake Placid and Montreal, the importation of ice-skating champion Sonja Henie for Hollywood productions and movies involving winter sports, all contributed to a stampede for winter clothes and sports equipment. The boom could not be confined to winter out of doors. Promoters found it profitable to bring winter in doors. Department stores rigged up slides covered with borax and hired instructors for their customers. Theaters found an easily handled chemical method of making ice on

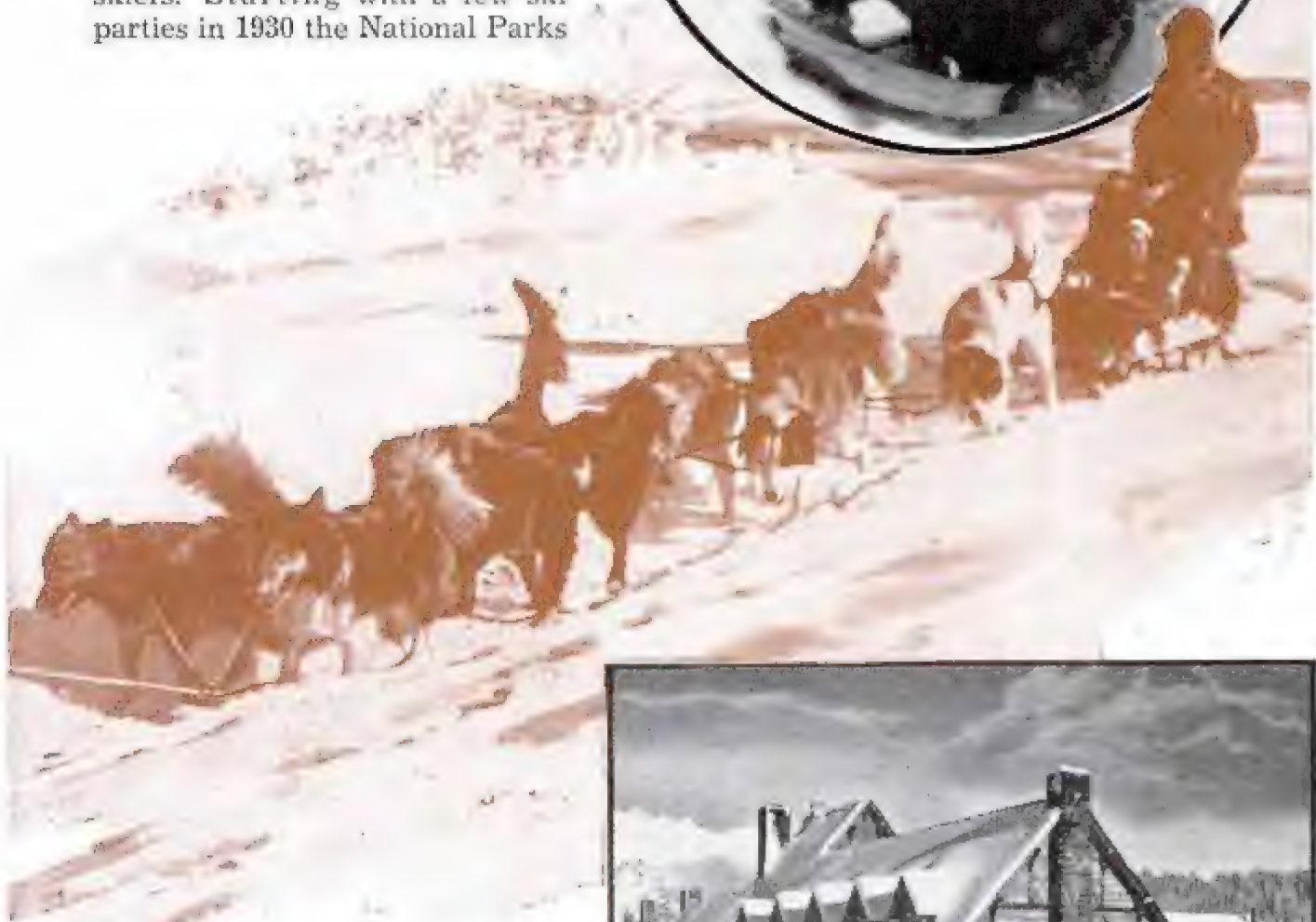
their stages for skating acts. A show in Madison Square Garden featured a ski-jump which ran from the rafters. For snow, tons of ice were ground into tiny particles and sprayed into blankets.

From 1931 to 1935 the output of snowshoe and ski manufacturers has doubled almost yearly, and today these items at the factory are valued over a half million dollars. Bobsleds, sleighs and children's sleds have factory values exceeding \$1,500,000.



Ice skates have a factory output valued at over a million dollars.

Altogether there are about eighty winter playgrounds scattered through the Poconos and Alleghenies in Pennsylvania, the Catskills and Adirondacks in New York, the Green Mountains in Vermont, the White Mountains in New Hampshire, the Berkshires in Massachusetts and Connecticut, and the Rockies and coastal ranges of the far west. New England, with an extensive network of downhill skiing trails, gets most of the business from city week-end skiers. Starting with a few ski parties in 1930 the National Parks



have increased in popularity until last year over 150,000 visitors crowded in for winter sports. Seven girls' schools feature a week of skiing in the National Parks as part of their curriculum.

Today there are toboggan slides, skating rinks and ski runs near almost every large city in the northern states. In most of the

(Continued to page 118A)

Circle, "ash-canning." Center, huskies hauling a winter vacationist. Bottom, 130-inch snow at Mount Rainier sends sports fans away for a day of fun.

paradise

Chains Repaired Quickly with Double-Jawed Tool



Closing new link in tire chain after worn link has been spread open and removed by second jaw of tool

Repairing worn and broken tire chains is simplified by a double-jawed tool which takes the place of the hammer, cold chisel and bench vise. The chain is spread out on the ground and the closed link picked up between the spreader points of the tool. Slight pressure on the long handles forces open the link. Then the new link is inserted, placed between the notched jaws of the tool and another squeeze of the handles closes the link evenly and securely.

Weight of Aerial Maps Shows Acreage Devoted to Crops

Close estimates of the acreages devoted to various crops in the Rio Grande valley were obtained by weighing aerial maps of more than 2,000,000 acres. Aerial photostatic prints were made of the growing crops on a scale of two inches to the mile in open country or four inches to the mile in congested areas. The various crops could be identified on these pictures and numbered or colored. Then the maps were traced on clear celluloid sheets and these were cut out on the boundary lines of the different crops. All the celluloid pieces

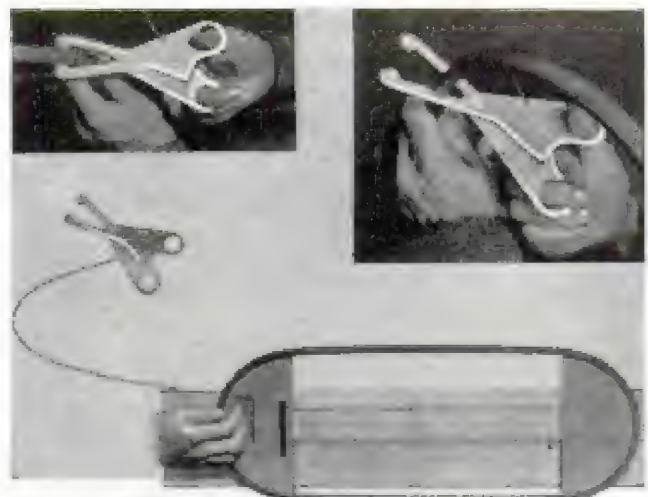
representing wheat, for example, were then weighed and the weight converted into total acreage by comparison with the weight of a sample of known acreage.

Portable Steel Scaffold Units Built of Welded Tubes

Whether the job be painting the barn or redecorating the interior of a vast cathedral, as illustrated on the opposite page, steel scaffolding sections built of welded tubing offer maximum safety to the worker at a saving in time and cost. Made in portable units, this scaffolding can be assembled speedily and raised to any height without sacrificing safety. The parts come packed in a flat bundle, and adapt themselves readily to intricate architectural shapes for interior work. Erection requires no tools, and there is no chance of faulty construction. There are no projecting ends to damage woodwork or fixtures. There is no waste, for the scaffolding can be dismantled and used again indefinitely.

Scissor-Like Gauge Tells Size of Belts Used on Pulleys

Pulley belts can be measured with a scissor-like gauge just introduced. It tells the angle, width and circumference of the belt, giving the angle graduations every two degrees from twenty to sixty and the linear measurement every sixteenth inch from zero to two inches. The inside circumference of the belt loop is measured on a board meter with readings every quarter inch from twenty-five to sixty inches.

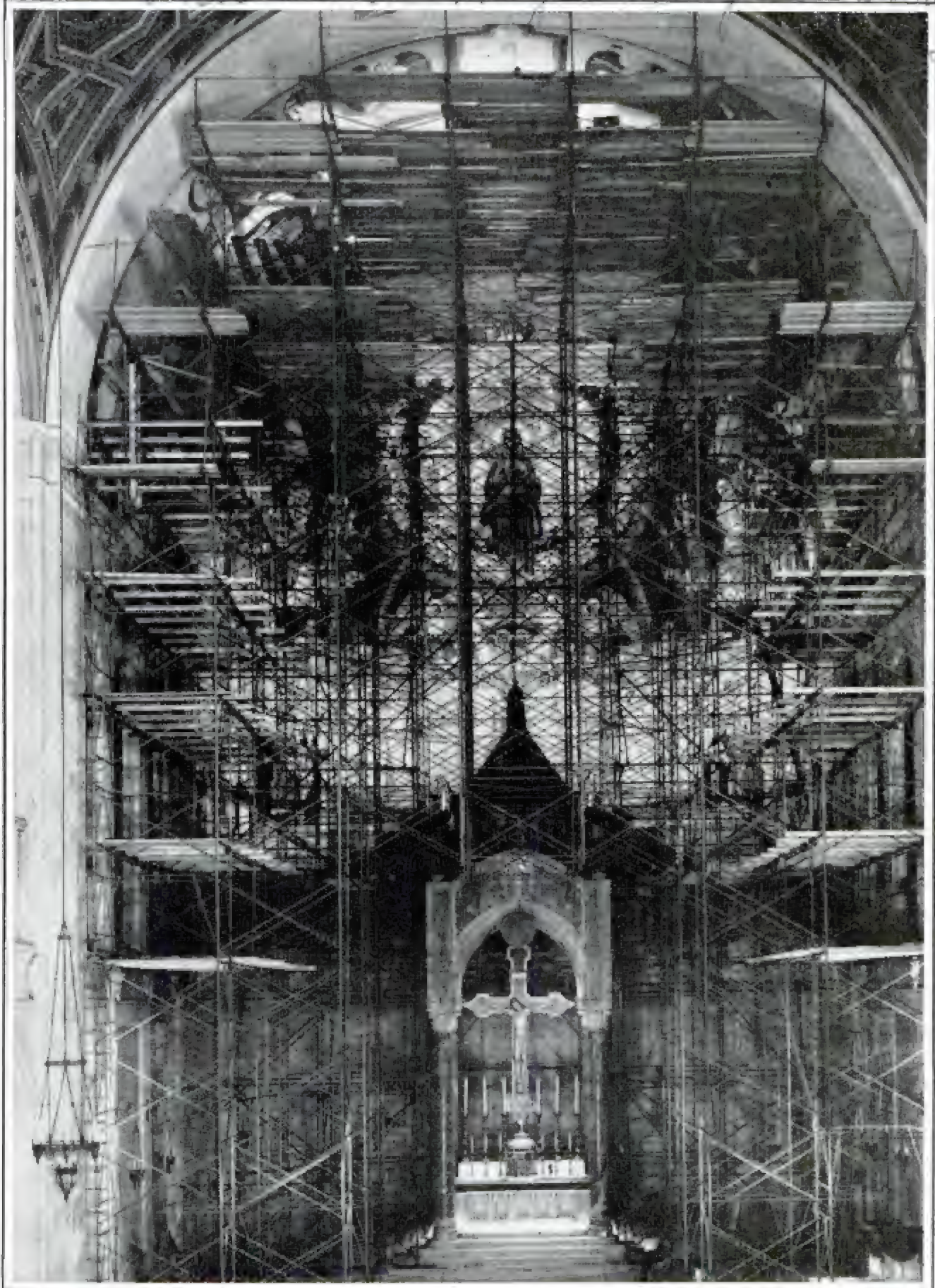


Reading on scissor gauge tells width and angle of belt, board meter below shows inner circumference

Californian Products
Lakeview Ave.

Decorators Weave Web of Steel in Cathedral

Queen of the Holy Virgin Cathedral



Mexico, D.F.

Scaffolding built up of portable sections adapts itself to contours of cathedral being redecorated. These units, made of welded steel tubing, are packed in flat bundles. Their use is described on opposite page

Euler Equipment Co.

25972 Mrs. Tay Garnett The Squeaky
334 J Avenue
Coronado Calif

AROUND the WORLD



the sets in Hollywood. The manner, if not the actual technique, used in harnessing up these shots is familiar to movie-goers. Against these backgrounds, superimposed on transparent screens, the film players reenact the story on Hollywood stages.

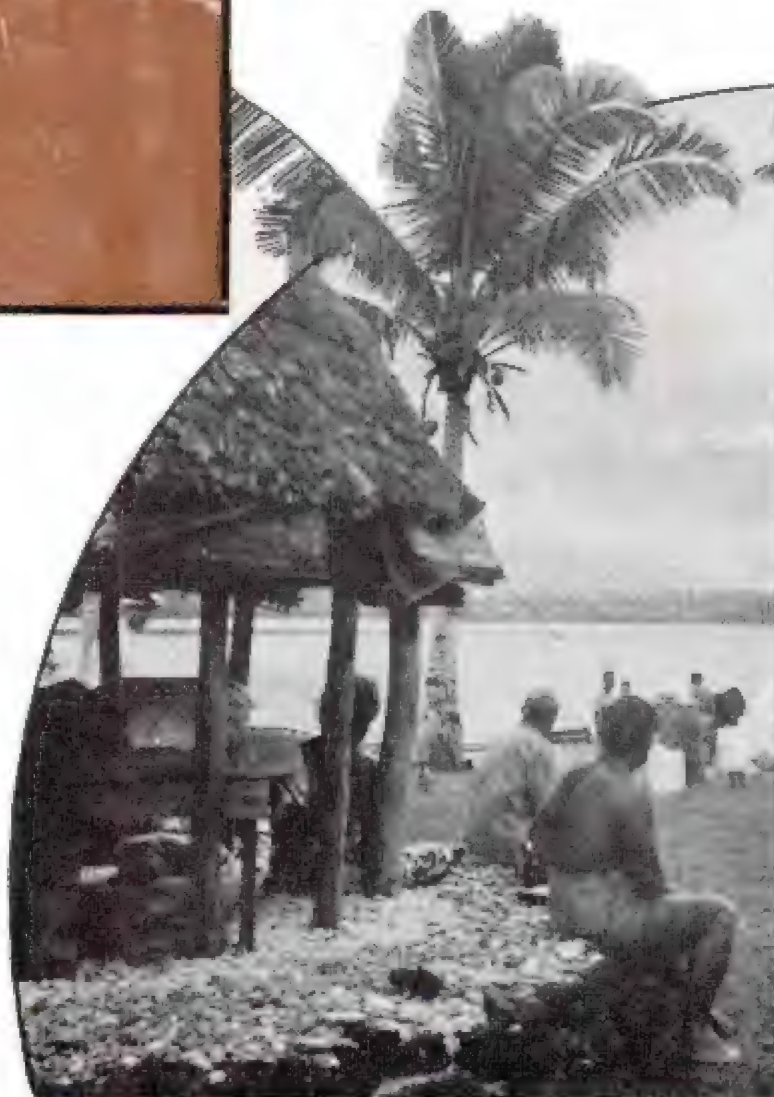
Film-making expeditions as such are not new in Hollywood. Travelogues have been an integral part of the film fare for many

Top, Mrs. Tay Garnett, camera-woman, shaking hands with a Japanese screen beauty. Bottom, native members of "The Hurricane" cast rest while the weather delays production in Samoa

ONCE Hollywood boasted of having the world at its front door. Any spot, however remote, could be duplicated on the studio lots or by short location trips to the near-by countryside.

Technical crews could be dispatched to a convenient mountain range, a desert or a harbor—and presto, these places became the Canadian Rockies, the Sahara desert or Singapore's teeming waterfront. Add a few studio shots to the reels made at any one of these and the picture was complete.

Now comes a different plan. Film experts have journeyed to out-of-the-way corners of the world for romantic backgrounds that have never been used on the screen. They have learned that millions of dollars worth of authentic scenery can be filmed at a fraction of the cost that would be required to build





for REALISM



Top, filming ceremonial parade in Indo-China. Below, Mrs. Garnett getting a scene on the Saigon river in Indo-China

years. Likewise, there have been many pictures dealing with the lives and customs of the Polynesians, the Head Hunters of the Amazon, Eskimos and other strange peoples. Then, too, there have been location trips into remote

sections by directors, technicians, film players and cameramen. So many of these have either been dismal failures or marked by such high production costs, aggravated by damage suits growing out of location accidents or illnesses, that the majority of the studios have been content to build the world in their own back yards.

The practicability of traveling



into foreign countries for novel settings recently was demonstrated by Tay Garnett, a Hollywood director, who, with a party of fourteen, went around the world to shoot realistic backgrounds for "Trade Winds" and "World Cruise," two forthcoming pictures. Approximately eight months were spent in filming 65,000 feet of backgrounds in Hawaii, Japan, China, the Philippines, Saigon, Penang, Malaysia, Ceylon, and a flock of other places that are merely spots on the globe even to people who know their way around.



Top, ten-year-old native climbing tree in "The Hurricane" while cameras grind in American Samoa. Left, Paul Schwegler finds cigarettes more effective than money in getting natives to pose for the movies

Before embarking on this 40,000-mile trip, Garnett sought to eliminate the difficulties that had beset other expeditions. The film safaris into the jungles, for example, had been headaches to the producers because of film spoilage. The sensitive cellulose substance could not stand the heat and humidity of the tropics. Frequently, the emulsion would come off the film two or three hours after it had been loaded into a camera.

James B. Shackelford, ace cameraman, was set to work on this problem. Veteran of eight shooting expeditions, including several into the Gobi Desert with Roy Chapman Andrews, Shackelford built a complete film laboratory aboard the thirty-eight-year old racing yacht that was used for the voyage. It was so designed that a constant temperature of sixty-five degrees could be maintained throughout the trip.

es972



Top, camera crew preparing to film outrigger canoe in "The Hurricane" with palm and cloud background. Center, Japanese actor in weird costume at festival

Special equipment making possible the development of 800 feet of film an hour was installed. Provision also was made to place the reels in hermetically sealed containers so that they could withstand the extremes in temperatures.

Starting from Los Angeles harbor, the "Athene," which measures 102 feet overall, sailed across the Pacific and the Indian Ocean, through the Red Sea, the Mediterranean, and the Bay of Biscay, to England. Then across the English channel, through the Kiel Canal, touching Denmark, Norway and Sweden and back to England through the Bay of Biscay, past Madeira Islands. On the homeward trip, the craft crossed the Atlantic to Miami Beach and from there homeward to San Pedro via the Panama Canal.

En route to Honolulu, the ship's tailshaft broke and the propeller was dropped onto the floor of the Pacific. Near Manila, the



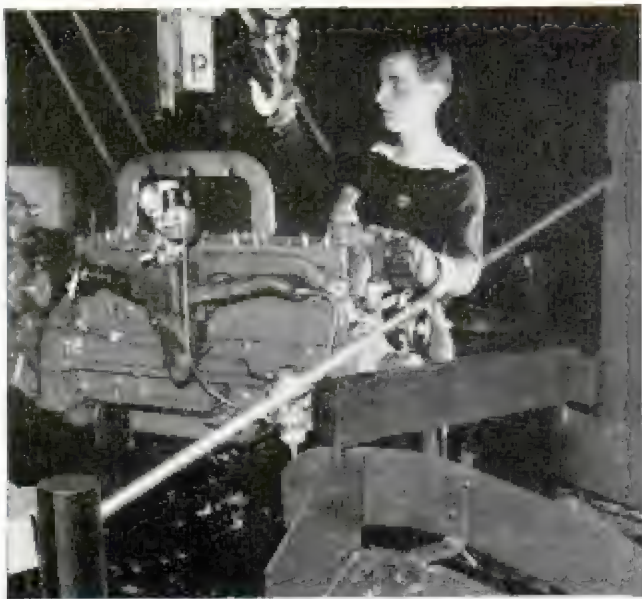
The Garnetts take a few shipboard scenes on their 40,000-mile cruise around the world to shoot realistic backgrounds for motion pictures

(Continued to page 138A)

Handwritten notes on the right margin, including "The Garnetts" and "40,000-mile cruise around the world to shoot realistic backgrounds for motion pictures".

es 899.

'Electric Eye' on Motor Line Replaces Mechanical Trip



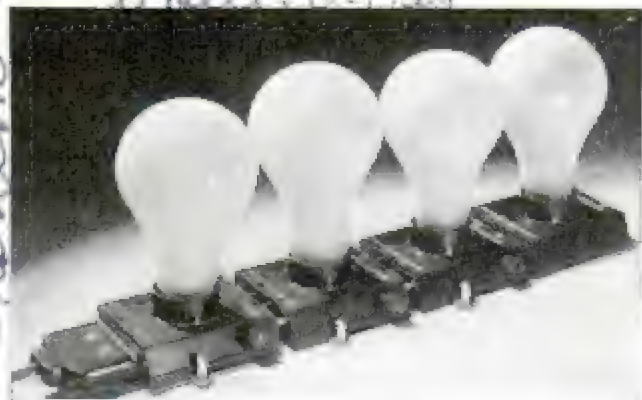
Electric eye stops assembly line as motor interrupts light beam (shown in white)

As a substitute for mechanical trips which wear out quickly, photoelectric cells, or "electric eyes," are used at the Pontiac factory to operate switches which stop the line of moving motors. Interruption of a beam of light causes the electric eye to halt the line so that a motor may be picked up and lowered to the automobile assembly line below.

es 1032

Simple Unit Flasher for Signs Replaces Costly Controls

Instead of costly motor or clockwork mechanisms, simple unit flashers may be employed to animate signs, window displays and exhibits. Hardly more complicated than a light socket and requiring no special mounting or wiring, the flasher is



Four unit flashers with bulbs which may be set to light in sequence for sign

a self-centered automatic and adjustable timing device which plugs in on the lighting circuit or connects with a similar unit. The flashers are equipped with sockets, timing knob and grouping switch, as well as prongs and jacks for connections. The units are simply pushed together to couple them mechanically and electrically in a string. The first unit of the string connects with the nearest alternating or direct-current outlet and its bulb flashes on, followed by the second, then the third and so on. When all the bulbs have been on for a few moments, the entire string extinguishes and the cycle is repeated. The timing interval from one unit to the next may be made faster or slower by turning the timing knobs of the units. Two or more bulbs may be flashed simultaneously by means of the grouping switches.

es 990

Driveway Lighted without Glare by Special Curved Reflectors



Lamps on curved post shed glareless light and soft glow is reflected from footlights of concrete wall

Two methods of lighting a driveway brightly but without glare are in use on an auto drive near Cincinnati. Lighting it from above are five circular fan-type lights mounted on a curved support. They throw a smooth mellow glow over the road without shining directly into the eye. The other light shines up from the ground and is reflected to the driveway by a white concrete surface curving inward.

Cont. Day Technique
Notice V-169

Besbee Products Corp
Stanton, N.J.
Pontiac Motor Co, Pontiac, Mich

and the engine. For springs, rubber straps are used which weigh thirty-eight pounds less than metal springs. The car weighs 975 pounds. The frame is of oak, the body of three-ply veneer.

Blacksmith Shop on Truck Travels to the Customer



This blacksmith shop installed in a truck enables the operator to drive in search of business and to do the job right on the spot

Installed in a truck, the latest blacksmith shop travels to customers in several states. When a horse loses a shoe, the owner calls for the mobile smithy and has the animal shod, much in the manner of having a tire changed on an automobile.

Shape of Molecules in Gasoline Determines Knock Rating

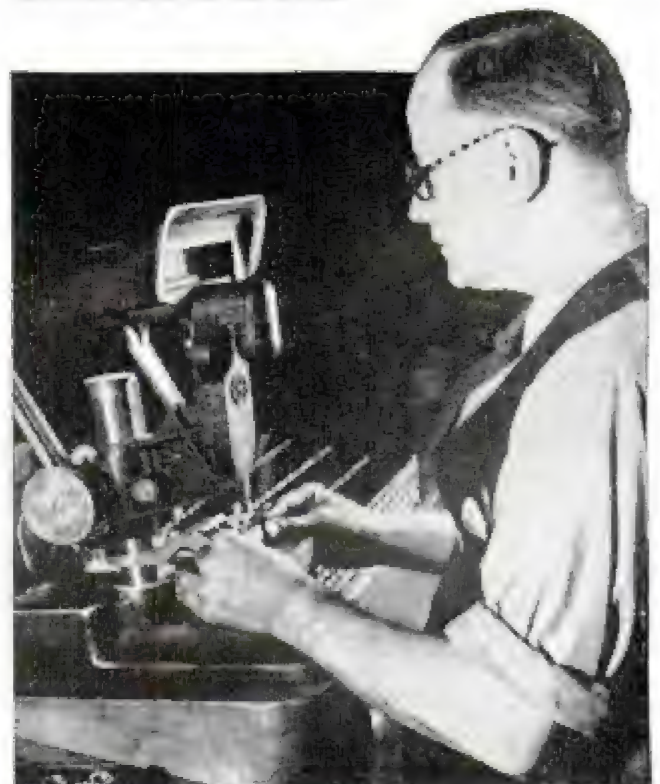
If chemists can learn to reshape the molecules of gasoline, they may develop knockless super-fuels that will drive smaller automobile and airplane engines more miles per gallon. Small quantities of such a high-test fuel have been made and tested under severe conditions in the laboratory, and it remains to produce it on a commercial scale. Automotive engineers have long known that increasing the compression ratio of a motor produced more power and economy, but with the available gasoline it was impossible to eliminate the knock entirely. Now the chemists have discovered that gasoline knocks badly if its molecules—the building blocks of na-

ture—have a long, stringy shape; but if its molecules are compact and ball-shaped, the gasoline is an excellent fuel. So great is the difference between molecules of the same size but of these two types that one gasoline may deliver fifty per cent more power than the other.

Shadowgraph Tests Piston Pins' Accuracy

Accuracy to an extreme degree is achieved by checking the measurements of automobile piston pins on a "shadowgraph" used in the Dodge factory. The pins are pressed against two polished steel blocks provided with points of carboloy and contacted by a diamond-topped plunger. The pins translate their

dimensions by means of amplified shadows detecting differences as small as one-tenth-thousandth of an inch.



Shadowgraph, at top of machine, closely checks measurements of auto piston pin

W. L. Lovell and J. W. Campbell, Lab. for the Electric Motor, Westinghouse, Pittsburgh, Pa.

Science Service

Dodge Bros. Corp.
7900

Rubber Seats in Train and Bus Offer Comfort

New comfort and safety for passengers on trains and buses is made possible by the use of sponge-rubber cushioning materials in seats, seat backs, headrests and mattresses. Constructed with millions of tiny interconnected air cells the rubber cushion is intensely porous. It "breathes" easily, toning down and tapering off all riding shocks, to give the passenger exceptional comfort. A special process renders the surface of the cushion impervious to accidental ignition, giving the added feature of fireproofing. There are no metal springs to break, weaken or rip through the upholstery, causing injury to passengers and damage to clothing. The cushion-



Top, filling molding trough with whipped latex. Bottom, left, removing the latex cushion from the mold. Right, cutaway view of bus seat, showing air space which increases riding comfort

ing material is made by whipping latex, crude rubber, into a frothy cream-like liquid in much the manner of whipping cream and then applying molds of the proper shape. The size, shape and density of the cushions are scientifically engineered for the job they must do. Mattresses of the whipped latex are being used on railroad sleeping cars. The cushioning material is produced by Firestone Tire and Rubber company, Akron Ohio.

Popular Mechanics Magazine does not publish the name of the maker of, or dealer in, any device described in its pages, but this information will be furnished by our Bureau of Information upon request, accompanied by stamped envelope.

Non-Clogging Shower Head Throws a Dual Stream

es 1009
Two Stream
Alma

Proof against clogging with lime, a shower head with a non-metallic face has all its working parts outside the water chamber. The shower head throws a double stream, not a hollow ring of water, and by turning a small handle its force is varied from a gentle shower to a stimulating needle spray.



Wiscor Inc
Los Angeles, Calif

Hydraulic Jack Is Worked from Standing Position



Notice pump and release valve are at top of hydraulic jack and motorist can pump while standing

Without even stooping, a motorist can operate and release a hydraulic bumper jack just introduced. It has a metal toe swiveling on a threaded barrel, the toe adjusting to the exact height of the bumper or its bracket. Thus the car's weight is suspended on the swivel toe and the full sixteen inches of hydraulic lift can be applied to raising the automobile. Pump and release valve are at the top, letting the operator stand upright. The jack has a capacity of one and one-half tons.

Drought Precipitates Pure Salt in Great Salt Lake

Three dry years in succession evaporated so much water from the Great Salt Lake in Utah that pure table salt, sodium chloride, actually was precipitated in the lake. Over a long period of years the salt concentration of the lake has varied from fifteen to thirty per cent, and thirty per cent is the maximum concentration that will remain in solution. After a survey of the lake, Prof. Walter D. Bonner of the University of Utah reported its average salti-

ness is twenty-eight per cent, and that drought in the summers of 1934, 1935 and 1936 had caused considerable evaporation and precipitated pure sodium chloride in the brine. Sodium sulphate or Glauber's salt, used for medicine, was found in rather large quantities in Great Salt Lake. It is much more soluble in warm water than in cold, and pure sodium sulphate crystals frequently form in the lake during the winter months.

Bank Deposit Dropped in Chute without Waiting for Teller

Depositors need not wait in line at the teller's window in a Tulsa, Okla., bank. They simply make out duplicate deposit slips, place them with the checks in a special envelope and drop it down a chute. On the way down this metal tube the envelope interrupts a light beam and a photoelectric cell causes a bell to ring, acknowledging the deposit. At the bottom of the chute is a receiving container attended by tellers. The duplicate deposit slip is mailed back to the patron. The chute is intended to receive deposits by check only.



Depositor drops envelope in chute of bank and hears bell ring indicating receipt of deposit.

Blackhawk mfg Co 116 N Broadway Milwaukee

Donkey of the West

Bank Tulsa, Okla.

W. Pollock

Hunt Goeduck with Shovels on Puget Sound



Upper left, goeduck hunter plies his shovel speedily on spotting the long neck of his quarry protruding from mud to feed at low tide. Right, the hunter, a bit muddy but with a good catch. Below at left is a closeup of the big clams showing the elastic neck



Hunting the elusive goeduck is a rare sport. There are only two places in the world to hunt it: along the eastern coast of Africa, and along the northwest coast of America, notably in Puget Sound. There are few opportunities to capture it, for you can reach it only at extreme low tides. And you hunt the goeduck not with gun or fishing rod or net, but with a shovel. Despite its name it is not even remotely related to the duck. It is, rather, a giant clam that lives deep in the tidewater mud flats, sometimes attains a weight of seven pounds and grows an elastic neck that can shrink from two or three feet in length to

five or seven inches when vibrations tell it an enemy is near. The goeduck hunter watches for this rubbery, hoselike neck protruding from the mud to feed on seawater organisms. Once sighted, he must ply the shovel speedily, following the goeduck's swift retreat into its shell perhaps three feet deep in the ooze. Sometimes a metal cylinder is sunk to prevent cave-ins while digging. Finally the hunter must reach down and pry the mollusk loose from the mud with his fingers. The goeduck—pronounced "gweduck" or "gooeyduck"—is creamy and tender, with a distinctive flavor. Its name is of Indian origin.

Expansion in summer adds an estimated sixty-one miles to the 111,350 miles of concrete highway in the United States.

Cont. Paul W. Hartner, 544-15th St. Santa Monica, Calif.

retumal Industries

Es. J. d. run Highway

*Model Railroad Club
of Milwaukee, Attn:
Joseph L. Smith!*

RAILROADING

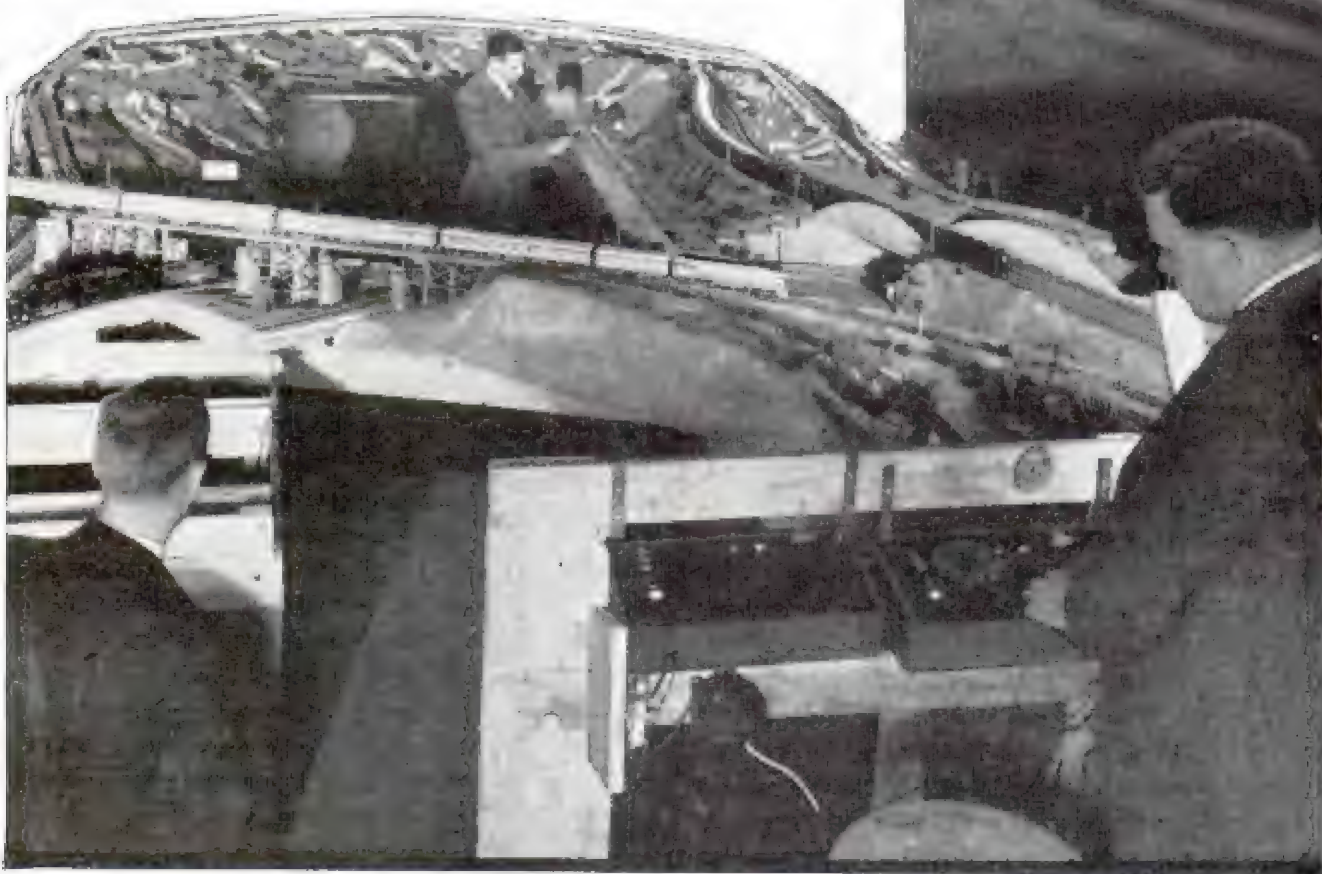
Q15 to National

THEY pounded a golden spike into the last wooden tie of a new railroad the other day—a railroad for men only. High railway officials and artists and bookkeepers stood solemnly side by side and watched the ceremony.

It was the last of 88,000 spikes hammered laboriously by hand into 22,000 wooden ties on one of the longest short lines in the world; a railroad 1,100 feet long, from which women and children are barred except on exhibition days.

The golden spike was small enough to lose beneath your fingernail. It symbolized completion of the Milwaukee Union Terminal Railroad, and a few minutes after it sank into the diminutive wooden tie a streamliner, headlight gleaming and lights aglow in her sleek string of canary yellow cars, snaked out of the yards and down the main line.

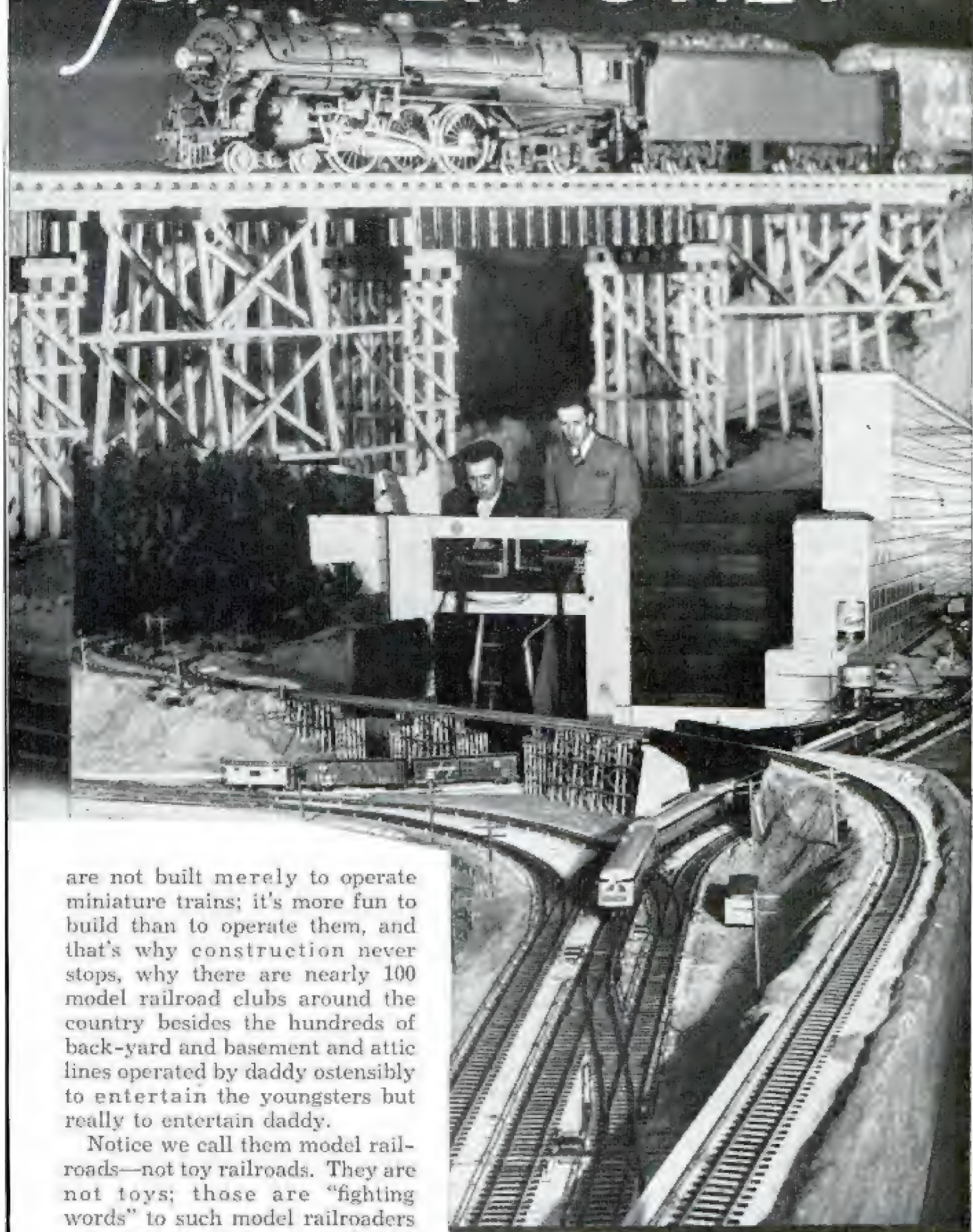
It was a mistake to say the railroad was completed. No properly run model railroad is ever finished. If it is, that railroad is a flop. Of course it is fun, as anyone from two to 102 years old will admit, to sit at the controls and, without even seeing the mixed freight as it glides along the westbound stretch in the next room, throw an electric switch and turn that train into the siding while you give the highball to the limited. But scale model railways



View from control tower of Milwaukee Union Terminal Railroad, with engineer, right, sending model streamline "Hiawatha" over trestle in foreground and freight snaking along main line at right

25959

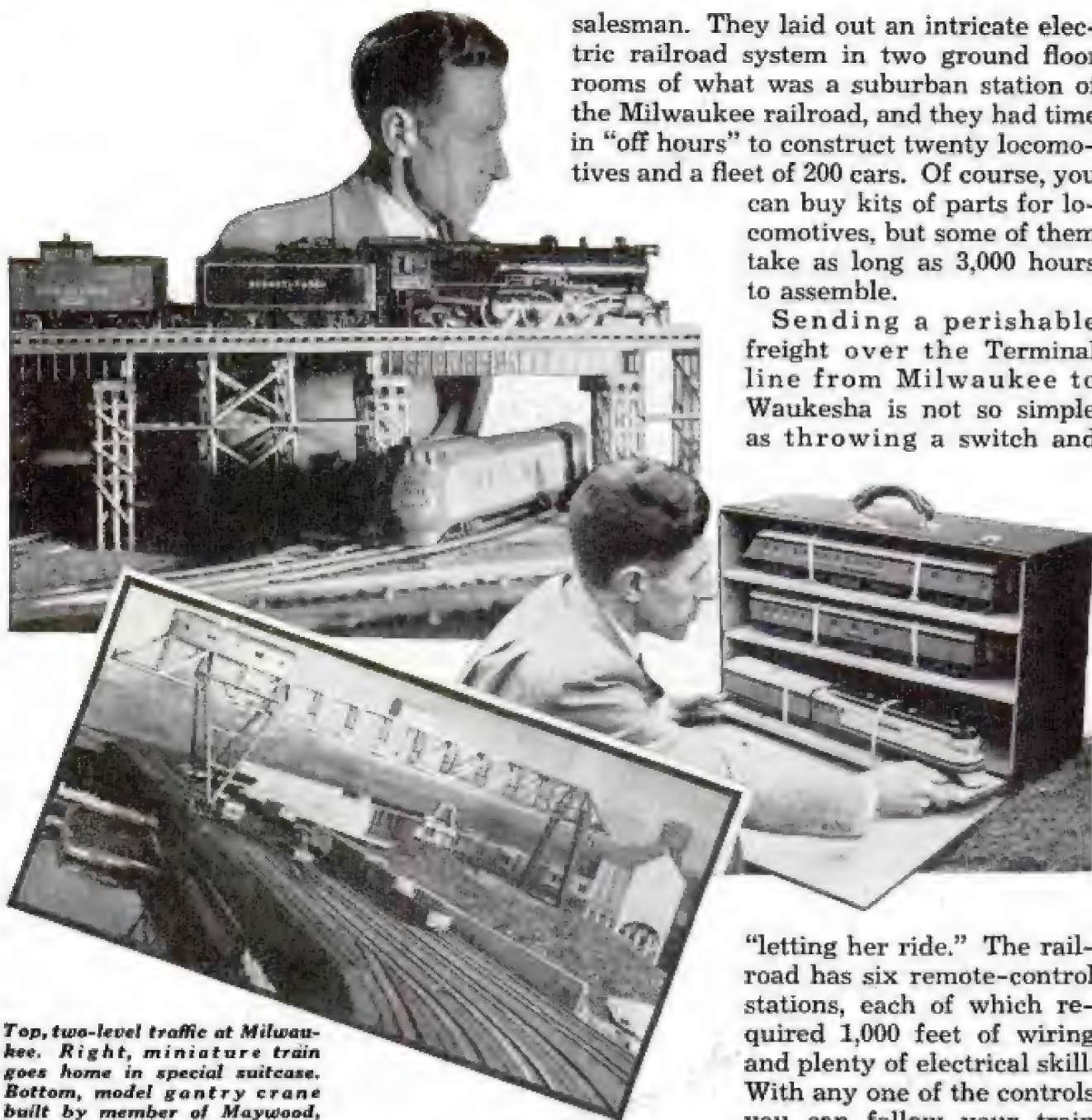
for MEN ONLY



are not built merely to operate miniature trains; it's more fun to build than to operate them, and that's why construction never stops, why there are nearly 100 model railroad clubs around the country besides the hundreds of back-yard and basement and attic lines operated by daddy ostensibly to entertain the youngsters but really to entertain daddy.

Notice we call them model railroads—not toy railroads. They are not toys; those are “fighting words” to such model railroaders as the New York Society of Model Engineers, who have been build-

Top, tiny freight crossing homemade trestle strong enough to carry man. Below, main line looking toward control tower



Top, two-level traffic at Milwaukee. Right, miniature train goes home in special suitcase. Bottom, model gantry crane built by member of Maywood, Ill., club loads coal with bucket

ing the thousand-foot Union Connecting Railroad for nearly ten years and hope they never finish it. Theirs is another line for men over twenty-one only. Men sneak away from the office, take quick lunches, and stay downtown evenings to "work" on the Union Connecting.

Maybe you think it isn't work? Try planning and laying 1,100 feet of track, 2,200 feet of brass rails spiked down to tiny ties, everything religiously on the quarter-inch-to-a-foot scale, as the Milwaukee railroaders did in six months. Their scenery painter is a steel company estimator, their chief electrician is a health department employe and the boss of the track-laying "section gang" is a typewriter

salesman. They laid out an intricate electric railroad system in two ground floor rooms of what was a suburban station of the Milwaukee railroad, and they had time in "off hours" to construct twenty locomotives and a fleet of 200 cars. Of course, you can buy kits of parts for locomotives, but some of them take as long as 3,000 hours to assemble.

Sending a perishable freight over the Terminal line from Milwaukee to Waukesha is not so simple as throwing a switch and

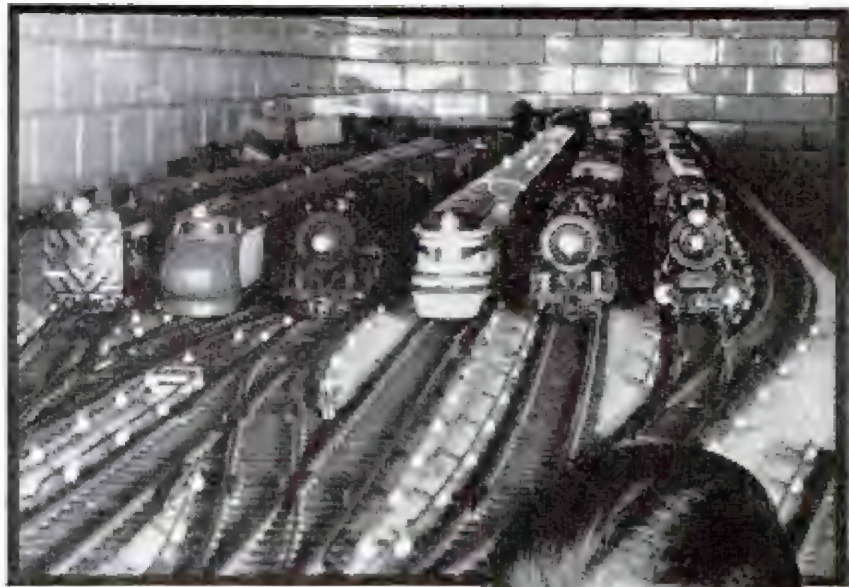
"letting her ride." The railroad has six remote-control stations, each of which required 1,000 feet of wiring and plenty of electrical skill. With any one of the controls you can follow your train around the system without

interfering with any other "engineer," advancing the circular control each time the locomotive enters a new block. Visual signals, three-color lights, tell you exactly what block your train is in. Like any efficiently operated model railroad it is almost impossible to have a collision, for with "automatic train control" the warning signals are set and current is withdrawn from any train approaching in an adjoining block. Rheostats govern train speed. A two-way switch indicates train direction, alternating current supplying power for forward operation while direct current from batteries is sent into the line to put the locomotive in reverse. There is also a neutral position in which the engineer can

turn on train lights without moving the engine.

One man could, of course, operate this 1,100-foot railway single-handed. But on exhibition nights when wives and children and neighbors are allowed to visit, the operating department expands and a druggist may become yardmaster, a schoolteacher chief dispatcher, and there are ten to twenty switchmen and towermen and engineers. Besides each circular control switch the engineers have their clips for train orders. Telephone lines are manned at twelve to fifteen stations, carrying train orders and reports of car loadings and movements and the position of empties.

There are sixty-seven switches and five crossings on the Milwaukee Union Terminal, several bridges and a trestle, a tall wooden structure that is an exact copy of a trestle just outside Milwaukee. It was built by one of the club members from a photograph of the original, and despite its diminutive size it is sturdy enough to carry a man's weight. The steel bridges,



Above, headlights gleaming, six trains line up for work in the "home" yards of the Milwaukee Union Terminal. Right, loading a flatcar with shipment of diminutive farm tractors. Bottom, view showing intricate track layout. Notice telephone lines, fences, and auto waiting at crossing for freight to pass



also faithful copies of real structures in the vicinity, are "welded" with solder.

Model railroaders can't stop as soon as the track is laid and the rolling stock is in

running order. Real railroads simply build their lines across the country; the model railroaders build country around their

(Continued to page 120A)

25-6-10-11-12-13-14-15-16-17-18-19-20-21-22-23-24-25-26-27-28-29-30-31-32-33-34-35-36-37-38-39-40-41-42-43-44-45-46-47-48-49-50-51-52-53-54-55-56-57-58-59-60-61-62-63-64-65-66-67-68-69-70-71-72-73-74-75-76-77-78-79-80-81-82-83-84-85-86-87-88-89-90-91-92-93-94-95-96-97-98-99-100-101-102-103-104-105-106-107-108-109-110-111-112-113-114-115-116-117-118-119-120-121-122-123-124-125-126-127-128-129-130-131-132-133-134-135-136-137-138-139-140-141-142-143-144-145-146-147-148-149-150-151-152-153-154-155-156-157-158-159-160-161-162-163-164-165-166-167-168-169-170-171-172-173-174-175-176-177-178-179-180-181-182-183-184-185-186-187-188-189-190-191-192-193-194-195-196-197-198-199-200-201-202-203-204-205-206-207-208-209-210-211-212-213-214-215-216-217-218-219-220-221-222-223-224-225-226-227-228-229-230-231-232-233-234-235-236-237-238-239-240-241-242-243-244-245-246-247-248-249-250-251-252-253-254-255-256-257-258-259-260-261-262-263-264-265-266-267-268-269-270-271-272-273-274-275-276-277-278-279-280-281-282-283-284-285-286-287-288-289-290-291-292-293-294-295-296-297-298-299-300-301-302-303-304-305-306-307-308-309-310-311-312-313-314-315-316-317-318-319-320-321-322-323-324-325-326-327-328-329-330-331-332-333-334-335-336-337-338-339-340-341-342-343-344-345-346-347-348-349-350-351-352-353-354-355-356-357-358-359-360-361-362-363-364-365-366-367-368-369-370-371-372-373-374-375-376-377-378-379-380-381-382-383-384-385-386-387-388-389-390-391-392-393-394-395-396-397-398-399-400-401-402-403-404-405-406-407-408-409-410-411-412-413-414-415-416-417-418-419-420-421-422-423-424-425-426-427-428-429-430-431-432-433-434-435-436-437-438-439-440-441-442-443-444-445-446-447-448-449-450-451-452-453-454-455-456-457-458-459-460-461-462-463-464-465-466-467-468-469-470-471-472-473-474-475-476-477-478-479-480-481-482-483-484-485-486-487-488-489-490-491-492-493-494-495-496-497-498-499-500-501-502-503-504-505-506-507-508-509-510-511-512-513-514-515-516-517-518-519-520-521-522-523-524-525-526-527-528-529-530-531-532-533-534-535-536-537-538-539-540-541-542-543-544-545-546-547-548-549-550-551-552-553-554-555-556-557-558-559-560-561-562-563-564-565-566-567-568-569-570-571-572-573-574-575-576-577-578-579-580-581-582-583-584-585-586-587-588-589-590-591-592-593-594-595-596-597-598-599-600-601-602-603-604-605-606-607-608-609-610-611-612-613-614-615-616-617-618-619-620-621-622-623-624-625-626-627-628-629-630-631-632-633-634-635-636-637-638-639-640-641-642-643-644-645-646-647-648-649-650-651-652-653-654-655-656-657-658-659-660-661-662-663-664-665-666-667-668-669-670-671-672-673-674-675-676-677-678-679-680-681-682-683-684-685-686-687-688-689-690-691-692-693-694-695-696-697-698-699-700-701-702-703-704-705-706-707-708-709-710-711-712-713-714-715-716-717-718-719-720-721-722-723-724-725-726-727-728-729-730-731-732-733-734-735-736-737-738-739-740-741-742-743-744-745-746-747-748-749-750-751-752-753-754-755-756-757-758-759-760-761-762-763-764-765-766-767-768-769-770-771-772-773-774-775-776-777-778-779-780-781-782-783-784-785-786-787-788-789-790-791-792-793-794-795-796-797-798-799-800-801-802-803-804-805-806-807-808-809-810-811-812-813-814-815-816-817-818-819-820-821-822-823-824-825-826-827-828-829-830-831-832-833-834-835-836-837-838-839-840-841-842-843-844-845-846-847-848-849-850-851-852-853-854-855-856-857-858-859-860-861-862-863-864-865-866-867-868-869-870-871-872-873-874-875-876-877-878-879-880-881-882-883-884-885-886-887-888-889-890-891-892-893-894-895-896-897-898-899-900-901-902-903-904-905-906-907-908-909-910-911-912-913-914-915-916-917-918-919-920-921-922-923-924-925-926-927-928-929-930-931-932-933-934-935-936-937-938-939-940-941-942-943-944-945-946-947-948-949-950-951-952-953-954-955-956-957-958-959-960-961-962-963-964-965-966-967-968-969-970-971-972-973-974-975-976-977-978-979-980-981-982-983-984-985-986-987-988-989-990-991-992-993-994-995-996-997-998-999-1000-1001-1002-1003-1004-1005-1006-1007-1008-1009-1010-1011-1012-1013-1014-1015-1016-1017-1018-1019-1020-1021-1022-1023-1024-1025-1026-1027-1028-1029-1030-1031-1032-1033-1034-1035-1036-1037-1038-1039-1040-1041-1042-1043-1044-1045-1046-1047-1048-1049-1050-1051-1052-1053-1054-1055-1056-1057-1058-1059-1060-1061-1062-1063-1064-1065-1066-1067-1068-1069-1070-1071-1072-1073-1074-1075-1076-1077-1078-1079-1080-1081-1082-1083-1084-1085-1086-1087-1088-1089-1090-1091-1092-1093-1094-1095-1096-1097-1098-1099-1100-1101-1102-1103-1104-1105-1106-1107-1108-1109-1110-1111-1112-1113-1114-1115-1116-1117-1118-1119-1120-1121-1122-1123-1124-1125-1126-1127-1128-1129-1130-1131-1132-1133-1134-1135-1136-1137-1138-1139-1140-1141-1142-1143-1144-1145-1146-1147-1148-1149-1150-1151-1152-1153-1154-1155-1156-1157-1158-1159-1160-1161-1162-1163-1164-1165-1166-1167-1168-1169-1170-1171-1172-1173-1174-1175-1176-1177-1178-1179-1180-1181-1182-1183-1184-1185-1186-1187-1188-1189-1190-1191-1192-1193-1194-1195-1196-1197-1198-1199-1200-1201-1202-1203-1204-1205-1206-1207-1208-1209-1210-1211-1212-1213-1214-1215-1216-1217-1218-1219-1220-1221-1222-1223-1224-1225-1226-1227-1228-1229-1230-1231-1232-1233-1234-1235-1236-1237-1238-1239-1240-1241-1242-1243-1244-1245-1246-1247-1248-1249-1250-1251-1252-1253-1254-1255-1256-1257-1258-1259-1260-1261-1262-1263-1264-1265-1266-1267-1268-1269-1270-1271-1272-1273-1274-1275-1276-1277-1278-1279-1280-1281-1282-1283-1284-1285-1286-1287-1288-1289-1290-1291-1292-1293-1294-1295-1296-1297-1298-1299-1300-1301-1302-1303-1304-1305-1306-1307-1308-1309-1310-1311-1312-1313-1314-1315-1316-1317-1318-1319-1320-1321-1322-1323-1324-1325-1326-1327-1328-1329-1330-1331-1332-1333-1334-1335-1336-1337-1338-1339-1340-1341-1342-1343-1344-1345-1346-1347-1348-1349-1350-1351-1352-1353-1354-1355-1356-1357-1358-1359-1360-1361-1362-1363-1364-1365-1366-1367-1368-1369-1370-1371-1372-1373-1374-1375-1376-1377-1378-1379-1380-1381-1382-1383-1384-1385-1386-1387-1388-1389-1390-1391-1392-1393-1394-1395-1396-1397-1398-1399-1400-1401-1402-1403-1404-1405-1406-1407-1408-1409-1410-1411-1412-1413-1414-1415-1416-1417-1418-1419-1420-1421-1422-1423-1424-1425-1426-1427-1428-1429-1430-1431-1432-1433-1434-1435-1436-1437-1438-1439-1440-1441-1442-1443-1444-1445-1446-1447-1448-1449-1450-1451-1452-1453-1454-1455-1456-1457-1458-1459-1460-1461-1462-1463-1464-1465-1466-1467-1468-1469-1470-1471-1472-1473-1474-1475-1476-1477-1478-1479-1480-1481-1482-1483-1484-1485-1486-1487-1488-1489-1490-1491-1492-1493-1494-1495-1496-1497-1498-1499-1500-1501-1502-1503-1504-1505-1506-1507-1508-1509-1510-1511-1512-1513-1514-1515-1516-1517-1518-1519-1520-1521-1522-1523-1524-1525-1526-1527-1528-1529-1530-1531-1532-1533-1534-1535-1536-1537-1538-1539-1540-1541-1542-1543-1544-1545-1546-1547-1548-1549-1550-1551-1552-1553-1554-1555-1556-1557-1558-1559-1560-1561-1562-1563-1564-1565-1566-1567-1568-1569-1570-1571-1572-1573-1574-1575-1576-1577-1578-1579-1580-1581-1582-1583-1584-1585-1586-1587-1588-1589-1590-1591-1592-1593-1594-1595-1596-1597-1598-1599-1600-1601-1602-1603-1604-1605-1606-1607-1608-1609-1610-1611-1612-1613-1614-1615-1616-1617-1618-1619-1620-1621-1622-1623-1624-1625-1626-1627-1628-1629-1630-1631-1632-1633-1634-1635-1636-1637-1638-1639-1640-1641-1642-1643-1644-1645-1646-1647-1648-1649-1650-1651-1652-1653-1654-1655-1656-1657-1658-1659-1660-1661-1662-1663-1664-1665-1666-1667-1668-1669-1670-1671-1672-1673-1674-1675-1676-1677-1678-1679-1680-1681-1682-1683-1684-1685-1686-1687-1688-1689-1690-1691-1692-1693-1694-1695-1696-1697-1698-1699-1700-1701-1702-1703-1704-1705-1706-1707-1708-1709-1710-1711-1712-1713-1714-1715-1716-1717-1718-1719-1720-1721-1722-1723-1724-1725-1726-1727-1728-1729-1730-1731-1732-1733-1734-1735-1736-1737-1738-1739-1740-1741-1742-1743-1744-1745-1746-1747-1748-1749-1750-1751-1752-1753-1754-1755-1756-1757-1758-1759-1760-1761-1762-1763-1764-1765-1766-1767-1768-1769-1770-1771-1772-1773-1774-1775-1776-1777-1778-1779-1780-1781-1782-1783-1784-1785-1786-1787-1788-1789-1790-1791-1792-1793-1794-1795-1796-1797-1798-1799-1800-1801-1802-1803-1804-1805-1806-1807-1808-1809-1810-1811-1812-1813-1814-1815-1816-1817-1818-1819-1820-1821-1822-1823-1824-1825-1826-1827-1828-1829-1830-1831-1832-1833-1834-1835-1836-1837-1838-1839-1840-1841-1842-1843-1844-1845-1846-1847-1848-1849-1850-1851-1852-1853-1854-1855-1856-1857-1858-1859-1860-1861-1862-1863-1864-1865-1866-1867-1868-1869-1870-1871-1872-1873-1874-1875-1876-1877-1878-1879-1880-1881-1882-1883-1884-1885-1886-1887-1888-1889-1890-1891-1892-1893-1894-1895-1896-1897-1898-1899-1900-1901-1902-1903-1904-1905-1906-1907-1908-1909-1910-1911-1912-1913-1914-1915-1916-1917-1918-1919-1920-1921-1922-1923-1924-1925-1926-1927-1928-1929-1930-1931-1932-1933-1934-1935-1936-1937-1938-1939-1940-1941-1942-1943-1944-1945-1946-1947-1948-1949-1950-1951-1952-1953-1954-1955-1956-1957-1958-1959-1960-1961-1962-1963-1964-1965-1966-1967-1968-1969-1970-1971-1972-1973-1974-1975-1976-1977-1978-1979-1980-1981-1982-1983-1984-1985-1986-1987-1988-1989-1990-1991-1992-1993-1994-1995-1996-1997-1998-1999-2000-2001-2002-2003-2004-2005-2006-2007-2008-2009-2010-2011-2012-2013-2014-2015-2016-2017-2018-2019-2020-2021-2022-2023-2024-2025-2026-2027-2028-2029-2030-2031-2032-2033-2034-2035-2036-2037-2038-2039-2040-2041-2042-2043-2044-2045-2046-2047-2048-2049-2050-2051-2052-2053-2054-2055-2056-2057-2058-2059-2060-2061-2062-2063-2064-2065-2066-2067-2068-2069-2070-2071-2072-2073-2074-2075-2076-2077-2078-2079-2080-2081-2082-2083-2084-2085-2086-2087-2088-2089-2090-2091-2092-2093-2094-2095-2096-2097-2098-2099-2100-2101-2102-2103-2104-2105-2106-2107-2108-2109-2110-2111-2112-2113-2114-2115-2116-2117-2118-2119-2120-2121-2122-2123-2124-2125-2126-2127-2128-2129-2130-2131-2132-2133-2134-2135-2136-2137-2138-2139-2140-2141-2142-2143-2144-2145-2146-2147-2148-2149-2150-2151-2152-2153-2154-2155-2156-2157-2158-2159-2160-2161-2162-2163-2164-2165-2166-2167-2168-2169-2170-2171-2172-2173-2174-2175-2176-2177-2178-2179-2180-2181-2182-2183-2184-2185-2186-2187-2188-2189-2190-2191-2192-2193-2194-2195-2196-2197-2198-2199-2200-2201-2202-2203-2204-2205-2206-2207-2208-2209-2210-2211-2212-2213-2214-2215-2216-2217-2218-2219-2220-2221-2222-2223-2224-2225-2226-2227-2228-2229-2230-2231-2232-2233-2234-2235-2236-2237-2238-2239-2240-2241-2242-2243-2244-2245-2246-2247-2248-2249-2250-2251-2252-2253-2254-2255-2256-2257-2258-2259-2260-2261-2262-2263-2264-2265-2266-2267-2268-2269-2270-2271-2272-2273-2274-2275-2276-2277-2278-2279-2280-2281-2282-2283-2284-2285-2286-2287-2288-2289-2290-2291-2292-2293-2294-2295-2296-2297-2298-2299-2300-2301-2302-2303-2304-2305-2306-2307-2308-2309-2310-2311-2312-2313-2314-2315-2316-2317-2318-2319-2320-2321-2322-2323-2324-2325-2326-2327-2328-2329-2330-2331-2332-2333-2334-2335-2336-2337-2338-2339-2340-2341-2342-2343-2344-2345-2346-2347-2348-2349-2350-2351-2352-2353-2354-2355-2356-2357-2358-2359-2360-2361-2362-2363-2364-2365-2366-2367-2368-2369-2370-2371-2372-2373-2374-2375-2376-2377-2378-2379-2380-2381-2382-2383-2384-2385-2386-2387-2388-2389-2390-2391-2392-2393-2394-2395-2396-2397-2398-2399-2400-2401-2402-2403-2404-2405-2406-2407-2408-2409-2410-2411-2412-2413-2414-2415-2416-2417-2418-2419-2420-2421-2422-2423-2424-2425-2426-2427-2428-2429-2430-2431-2432-2433-2434-2435-2436-2437-2438-2439-2440-2441-2442-2443-2444-2445-2446-2447-2448-2449-2450-2451-2452-2453-2454-2455-2456-2457-2458-2459-2460-2461-2462-2463-2464-2465-2466-2467-2468-2469-2470-2471-2472-2473-2474-2475-2476-2477-2478-2479-2480-2481-2482-2483-2484-2485-2486-2487-2488-2489-2490-2491-2492-2493-2494-2495-2496-2497-2498-2499-2500-2501-2502-2503-2504-2505-2506-2507-25

Driver Stands Outside Cab While Backing His Truck



Three views of truck cab show how its door folds out of way of traffic and driver can stand on running board safely while backing truck

Truck cabs are now being arranged so that the driver can safely stand with one foot on the running board and one on the clutch, looking backward as he backs the truck. The cab door folds, its front half folding against the rear half and attaching to it with spring clips so that the door will not be caught by the wind. There is a safety railing at the end of the seat.

Mile-a-Minute Trains of U. S. Lead World in Mileage

More mile-a-minute train service is offered in the United States than in any other country in the world. At the end of 1930 there were twenty-five runs, covering 808 miles, on which trains averaged a mile a minute. Six years later the number of runs had increased to 568 and the total distance covered had climbed to 30,047 miles. In the same year the total mileage of similar fast trains in other countries was: France, 12,487; Germany, 7,982 and Great Britain, 6,206. Other nations report-

ed a total of less than 1,000 miles each. Of the American runs for 1936, there were 201 that were made by steam locomotives, 251 by electric trains and 116 by Diesel-powered engines.

Sidecar Is Equipped for One-Man Fire Department

Modern version of the smoky fire engine with its dashing horses is the "one-man fire department" of an Illinois town. The fireman rides a motorcycle with a sidecar in which all the equipment for swift action against a small fire is packed. This includes a one-inch hose with reducing connection to fit a standard two and one-half inch hydrant, a shutoff nozzle, five-gallon water can with hand pump, two and one-half gallon foam extinguisher, broom and hooked pike pole. Swift on the "getaway," this motorcycle is used chiefly for grass, rubbish and brush fires and saves the fire department an estimated twenty-five dollars for every run as compared with the automobile pumper with its crew of men.



All equipment necessary to battle small fire is packed in sidecar of motorcycle, inexpensive to run

The Autocar Co., Ardmore, Pa.

es 1043

Baltimore and Ohio Magazine
from Railway Magazine

Kites Used for Sky Billboards and Air Photos

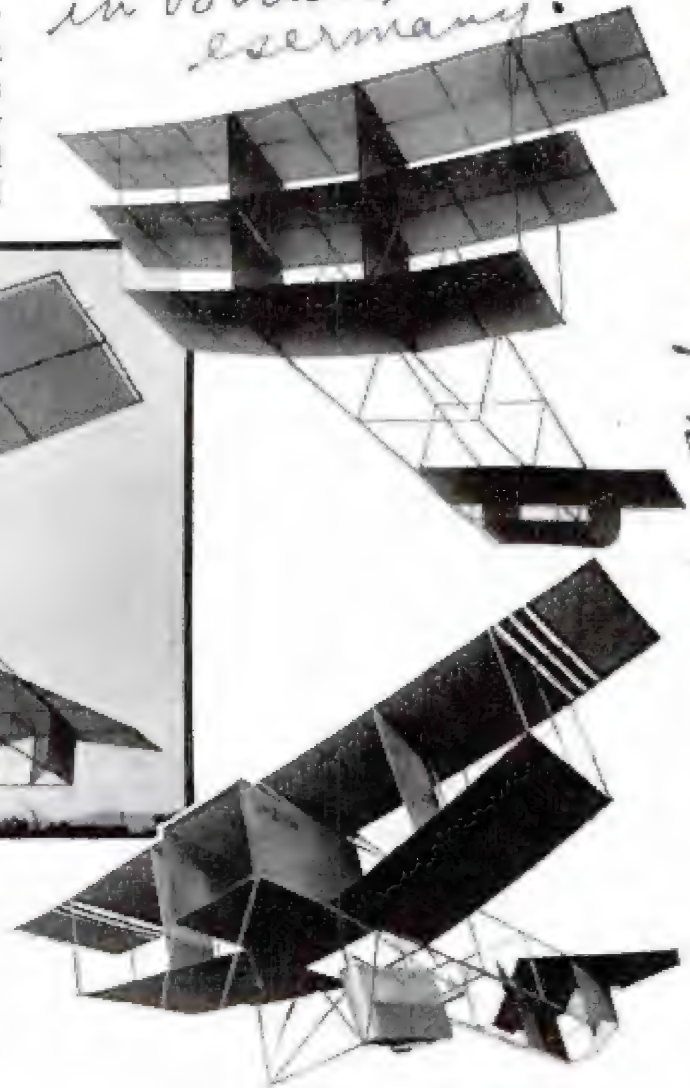
Kite-flying is more than a sport for youngsters in Germany. Huge kites built like airplanes, with advertising signs painted on their wings, are flown as sky billboards. Pamphlets are taken aloft and scattered from a special container fastened

in Baden, Germany.



Monoplane kite carries camera, biplane has container for dropping pamphlets. Triplane is latest type

beneath the "biplane kite." Aerial photographs are even made by attaching the camera to the underside of a big kite and flying it over the scene.



No U.S. agents known

Huge Coast-Defense Mortar Fired from Railway Track



Guarding the eastern seaboard from attack are huge mobile mortars, mounted on railway trucks for quick transportation to the firing zone. The twelve-inch mortar shown here has just been fired in artillery practice on the track at Fort Hancock. White smoke still belches from its mouth as the gun crew prepares to reload.

Worn-out steel rails are converted into grinding balls by a Canadian firm, to be used for crushing ore.

Acme

American Machine

11/15/37

Is 9 1/2 1/2 Kodak 8 material from Eastman Kodak & Rochester, NY

FOCUSING *Your* CAMERA



circle, old ones are missed, but pictures keep last Christmas always fresh.

Jot down a scenario for your scrapbook just as you would in planning a motion picture.

In the weeks before Christmas there are downtown shopping crowds to photograph. A youngster flattens his nose against a toy-shop window and gazes longingly; an old picture, but it's always new. Salvation Army Santa Clauses interview trusting kids; some times you can catch Santa Claus gazing, himself, into a cigar-store window with a longing look. Take a candid shot of your overworked postman toting holiday mail, and snap the first delivery

CHRISTMAS comes but once a year and lasts exactly twenty-four hours. That is, unless you have the formula for extending Christmas on and on into next year.

The formula is simple enough. Take a camera, load it with film, and start shooting Christmas atmosphere long before the big day. Don't stop shooting until the toy dog has broken his leg, the wreaths are packed away for another year and the fragrant pine tree is chopped up and set ablaze in the fireplace. Then you'll have a treasured collection of pictures to perpetuate that Christmas—for no two Christmases are alike. New faces join the family



Decorating the tree on Christmas eve, and Christmas games—both of them interesting holiday shots that call for "booster" light



on CHRISTMAS

boys arriving with mysterious packages. Then the Christmas story goes indoors to the decorations, the pile of greetings on the living-room table, the wrapping of packages and lighting of candles.

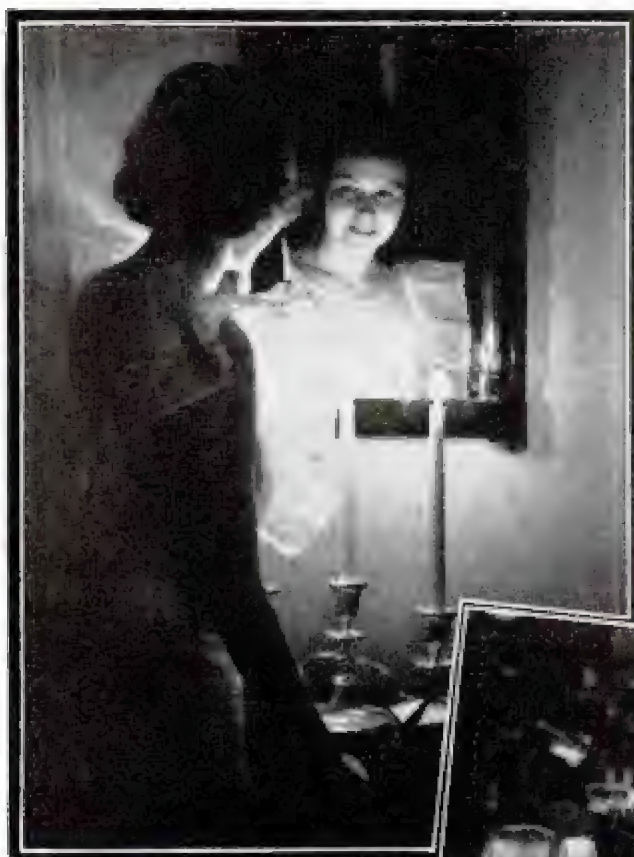
Load up with flash and floodlight bulbs for the climactic action of Christmas eve. The tree arrives, perhaps surreptitiously by the back door. Ornaments, tinsel, candy canes and packages adorn it. "Stockings are hung by the chimney with care." Someone tries out the mistletoe to see if it really works. Out in the kitchen there are dramatic picture possibilities in the tremendous activity around the stove.

Then on Christmas day there is the big climax—the youngsters racing downstairs in their pajamas to raid the tree, the new bicycle and pup, Dad monopolizing the electric train, Christmas dinner—a great chance to try out a natural color film with the indoor floodlights—and the drowsy household afterward.

In the early days, Christmas was seldom photographed. When the sun went south in the fall folks would put away the cam-



Here are two snapshots that belong in any permanent record of your Christmas celebrations



era until spring, thinking there wouldn't be much picture-taking during the winter. But now with the faster films, the electric lighting equal to daylight, and miniature cameras growing more popular daily, photography is a major indoor sport all

the year around. Even when Christmas day is over there are the remnants of the holidays to pick up on a spool of film to round out the story in your album; broken toys, holiday parties with the young squire or the young lady of the family in the first formal outfit; New Year's eve celebrations, the Christmas-tree burning, and finally, the back-to-school movement.

Make the holiday record intimate, personal, candid—something you and your friends will want to review and laugh over through the year. The story in pictures can even be made up into small albums as gifts next year for the persons concerned.

And if you want to make your own greeting cards from holiday snapshots, remember that you must do it a year ahead. When you suddenly decide next November or even early December to take some

Christmasy pictures for your card, you'll find you are almost a year too late. So be prepared; make your shots of snow scenes, of the stockings and tree and wreaths this year, and you'll be ready for next year's greeting without any last minute rush.

For those Christmas eve snaps around the house you will need special lighting. With a battery of floodlights or flashes you can "fire" almost at random. There are two sizes of Photoflood lamps; if your camera has a lens rated at $f6.3$, two or three of the No. 1 Photofloods in reflectors will usually be adequate for close shots at $\frac{1}{25}$ second, with the lens wide open. Faster lenses obviously require less light, or can

be used with faster shutter speeds. These lamps will burn for about two hours. The No. 2 Photoflood lamp is larger, with three times as much power, and they make possible indoor snaps with almost any camera.

Of course, you should use a fast, supersensi-

(Continued to page 116A)

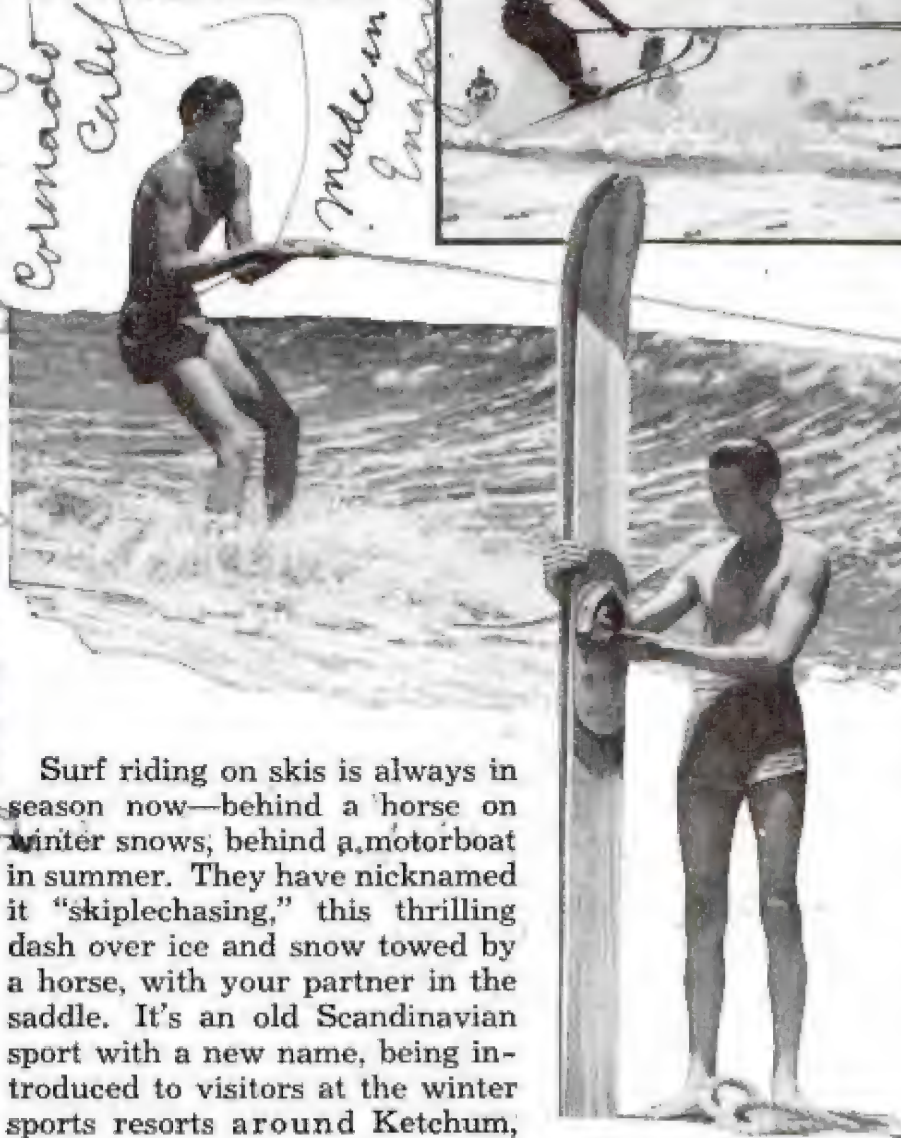


Candlelight portrait, top, needed time exposure; photoflash caught children in toy shop. Bottom, three-minute exposure offers Christmas idea

2966

Skis Take to Sea After 'Skiplechasing' Season

There are plenty of thrills and spills in "skiplechasing" over the snow in tow of a galloping horse. Below, a surf-rider on skis rides a breaker behind a motorboat. Notice the "shoe" to grip foot on water ski at bottom



Surf riding on skis is always in season now—behind a horse on winter snows; behind a motorboat in summer. They have nicknamed it "skiplechasing," this thrilling dash over ice and snow towed by a horse, with your partner in the saddle. It's an old Scandinavian sport with a new name, being introduced to visitors at the winter sports resorts around Ketchum,

Idaho. Sometimes the skier is pulled by a riderless horse which he must guide himself. The latest thrill along California shores is a surf ride on water skis behind a speedboat scudding through choppy waves at twenty-five to forty miles an hour. These skis are specially designed for water sports. They are about ten feet long and six inches wide, with metal fins, and on top is a built-on "shoe" to keep your foot from slipping. The great difficulty in learning ocean skiing is mastering the start, either from a boat landing on the shore or from a squatting position in shallow water.

Valve Spring Pressure Tested without Removing Head



Without removing the engine head of your car, the valve springs can be tested with a meter just developed for garage work. Pressure is shown in pound units on a direct reading scale. It is claimed that there is no danger of the lock dropping out while the spring is being raised for testing, since the pressure is applied directly beneath the locks. A special fixture is now being manufactured that is available to test valve and clutch springs located outside the car.

Cont. James Mc Jueley 334 J-Cur

Comrade Calif

Made in England

Abecrombie and Fitch
Stinger skis from Madison are and 48 in
H. L. James Mc Jueley

Swinnell Products Co
250 N. Manchester St

Model Tractor Run by Steam Made with Jeweler's Lathe



This steam traction engine model runs like the real thing, from throttle to steam gauge and whistle

It took a model builder five hours a day for more than a year to build a small scale model of a steam traction engine, complete in every detail. The steam gauge really shows pressure. The whistle, throttle, reverse, clutch and pump all work normally. There are eighteen flues in the boiler, and the tiny piston is complete with rings. Every part, even to the tiny bolts and rivets, was made by hand, using only a small jeweler's lathe—and there are more than 1,500 parts. The tractor model, excepting the labor involved, cost only \$3.50 and of that amount \$1.15 was spent for paint.

Earth Three Billion Years Old by Potassium "Clock"

If scientists read the radioactive potassium "clock" correctly, the earth is less than three billion years old. Like radium, the world supply of radioactive potassium is diminishing and over a long period of time changes into calcium. Scientists compute the age of the earth from the amount of calcium known today and the rate at which radioactive calcium decomposes.

Some 250,000,000 years ago, in the Carboniferous age, there was four to fifteen times as much radioactive potassium in the earth as today, and this may have had its effect on the changes in plant and animal growth in that period. According to the potassium clock, the earth's crust began to solidify 1,430,000,000 years ago.

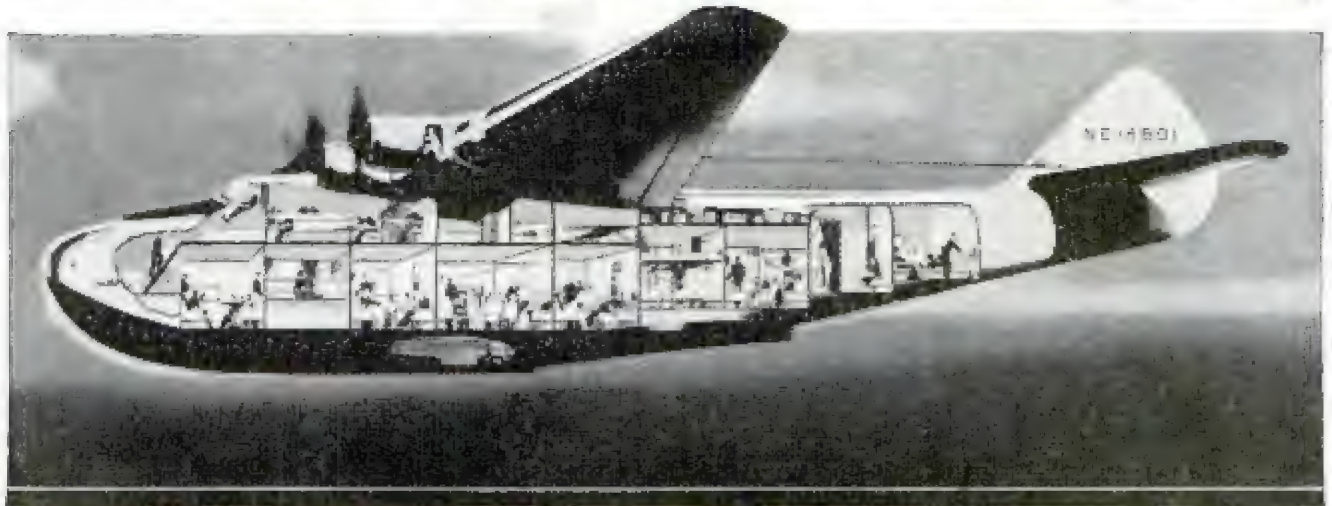
Color Wheel Matches Shades of Auto Fabrics and Paint

For matching shades exactly in the manufacture of automobiles, a color wheel has been designed by Studebaker. The wheel has three colors which fuse into one shade when operated at high speed. A disk on the wheel is marked off in degrees and the colors on it are standard so that the amount of each color can be measured and reproduced with scientific exactitude at any time, or place. The shades chosen for fabric and body colors for new cars can be ordered by telegraph to paint and upholstery companies and reproduced on their color wheel in the identical shade. To this shade is matched the paint or the cloth. The wheel also enables the auto factory to keep a complete and lasting record of all the delicate shades that have been used on the cars and to reproduce them instantly whenever they are wanted.



When the tri-colored wheel is rotated rapidly the blend will match fabric's color

Transatlantic Flying Hotel Will Carry Sixty



Here is a chance to peek inside the sky hotel which will fly across the Atlantic. Larger than the boats Columbus sailed, it will carry sixty persons. Notice mechanic reaching motor from passage in wing

Fifty passengers and a crew of ten will ride in ease and luxury in the flying hotels being built for Pan American Airways' transatlantic service. Six of these flying boats are in production. A quartet of motors built into the high, wide wings will deliver a total of 6,000 horsepower, enough to hurtle the forty-two ton craft through the skies at a top speed of 200 miles an hour. There are private cabins and sleeping compartments in the lower, aft section of the cabin and a large dining lounge in

the mid-section, beneath the cargo hold. Back of the pilot's cockpit is the chart room and the offices of the radio officer, navigator, engineer and captain. Passageways through the wings, which have a spread of 152 feet, allow the mechanic to reach each of the engines during flight. In the hold beneath the dining saloon are pumps to deliver fuel from the sea wings to the wing tanks. The liners will have a cruising range of 3,200 miles and weigh forty-two and one-half tons fully loaded.

Night-Club Set Moving on Rails Is Latest in the Movies

Mounted on steel rails, a night-club set constructed for a Paramount film creates something new in motion-picture effects. The entire set, with the exception of the walls, is movable on the rails. In one po-

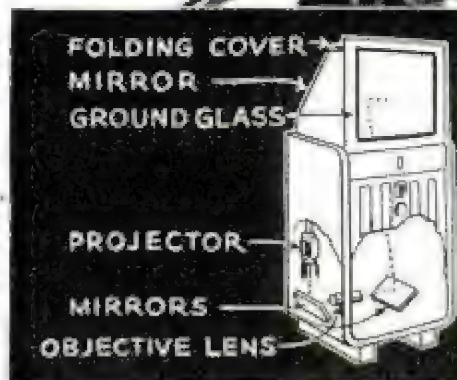
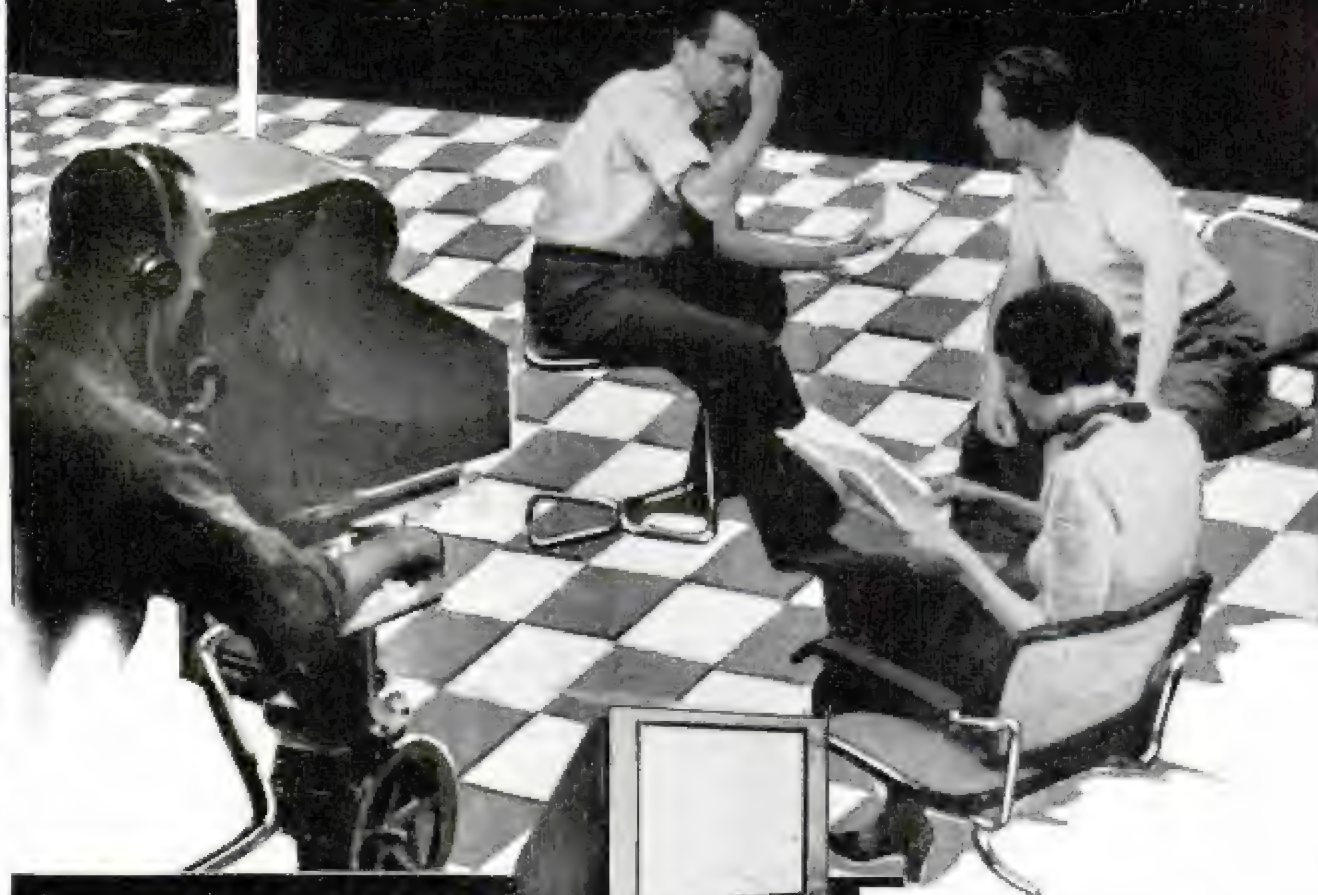
sition the set has Martinique-type ornamentation on the walls. From this it is moved into position where it has an ultra-modern background of flexible glass and modernistic designs. Nearly 200 people may be in the scenes at the same time, seated at tables on raised terraces and balconies, while the set is moved in a semi-circle by means of a powerful electric motor and cable. Tall telescoping doors, made from sheet steel, open and close during the scene. As a comedy turn in one part of the picture, one section of the set is left behind while the rest of the night club swings into a new position.



Moving night club set is shown leaving one table behind as comic touch

Popular Mechanics Magazine does not publish the name of the maker of, or dealer in, any device described in its pages, but this information will be furnished by our Bureau of Information upon request, accompanied by stamped envelope.

TELEVISION



screen which folds down. A third development is a projection-type receiver which reproduces on the screen a picture about thirty-nine by forty-seven inches. Two other sizes of home receivers

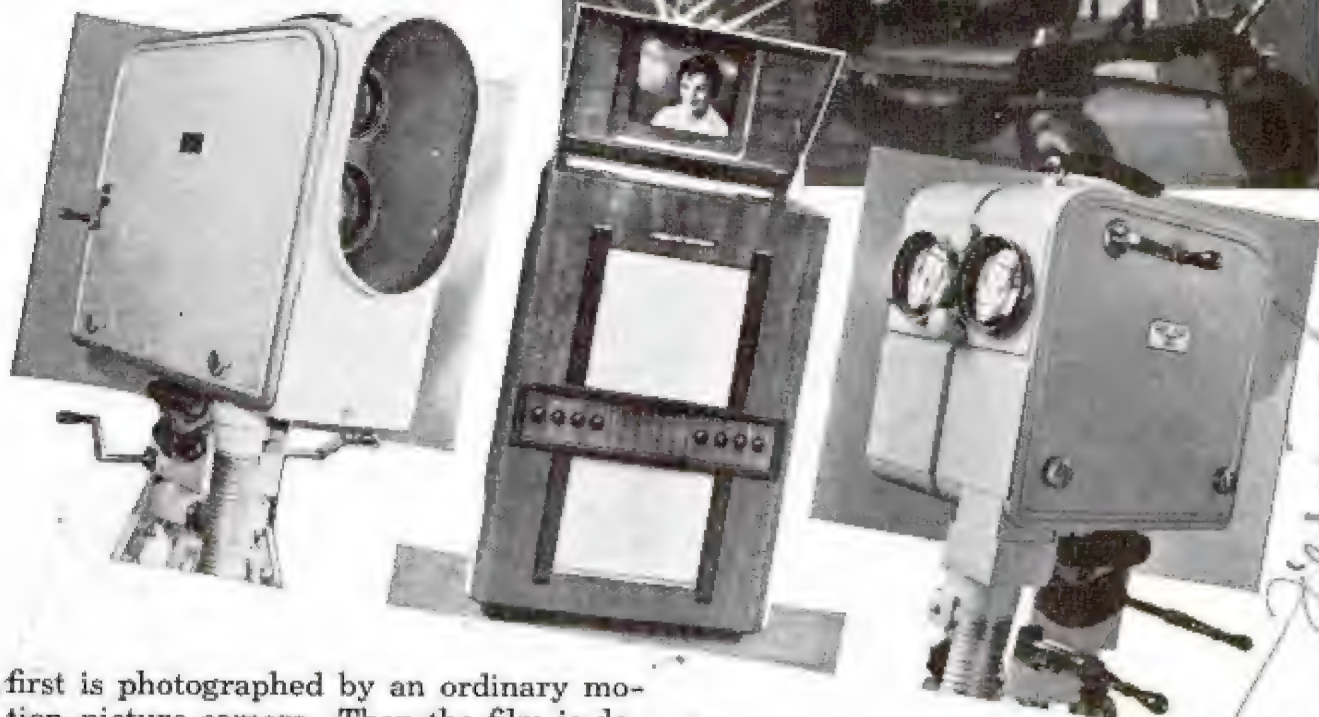
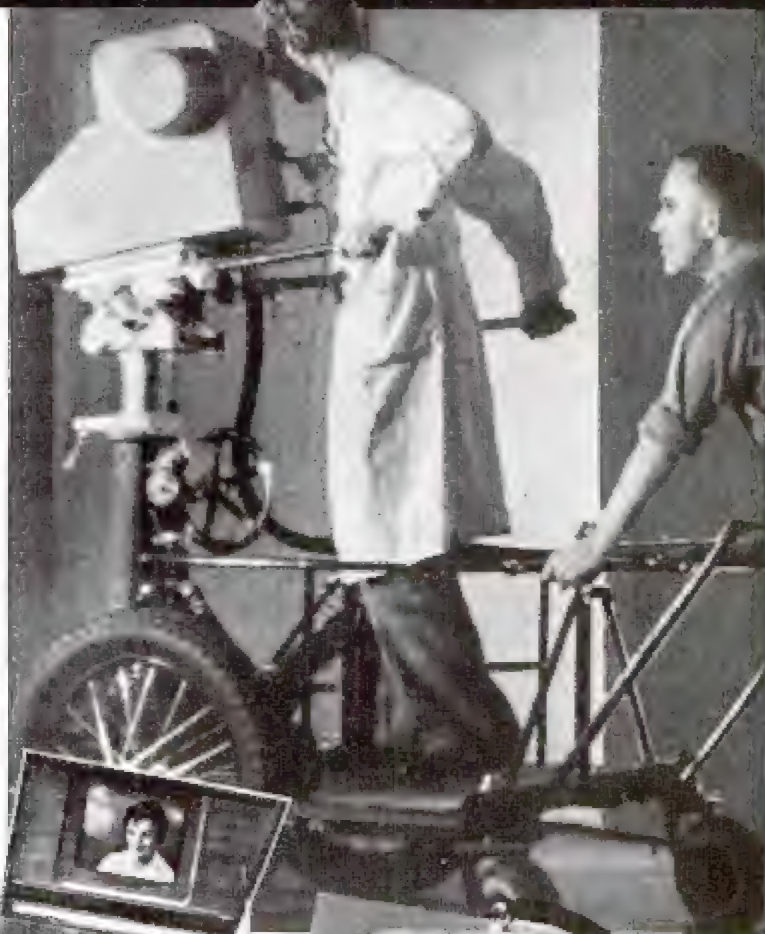
PRACTICAL television receivers for the home are ready for Germany's radio fans as the result of extensive experiment with various types of apparatus necessary for transmission and reception. Latest developments include the announcement of a combination of television, radio and phonographic reproduction in a single cabinet. The radio is an all-wave receiver of the superheterodyne type. Another cabinet is a projection-type television receiver, which uses a very small cathode-ray tube and three mirrors and lenses to project a picture approximately thirteen by eighteen inches upon a ground-glass screen. One model has a



Top, preparing to shoot a scene for television. Center, photo and diagram of home receiver. Bottom, regulating the quality of television in broadcasting station by means of monitor panels

in GERMANY

provide for the picture to be viewed in a mirror. One employs a twelve-inch cathode-ray tube, the other a nineteen-inch tube. An outstanding development, from a standpoint of technique in transmission of television pictures, is a control board or mixing panel which enables the operator to "fade" a film television program into a direct pick-up. Thus, this control makes it possible to eliminate abrupt changes in fading from one program into another, adding to enjoyment of programs. Considerable progress in development of a fast film process is reported. In this process, the scene

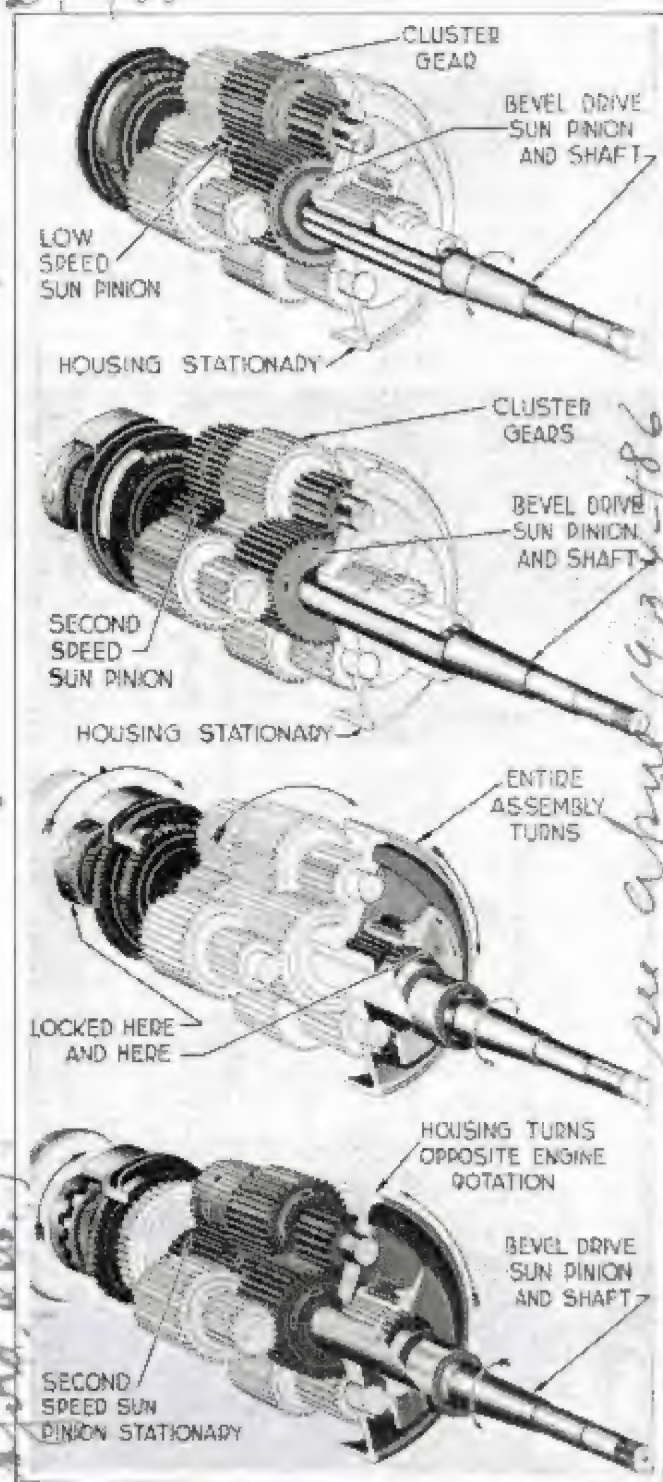


first is photographed by an ordinary motion-picture camera. Then the film is developed quickly and the part intended for television is taken from the film and transmitted. The process employs the high technique of modern motion-picture camera and newsreel. One German company has perfected an intermediate film apparatus which is quite compact, the whole device, including the film-developing equipment, being enclosed in a box not much larger than a standard radio receiver.

Top, how television pictures are taken. Bottom, left, electron-tube camera for use in stage work. Center, receiver with nineteen-inch cathode-ray tube. Right, small, easily portable television camera for indoor and outdoor work

New film and chemicals for speedy developing have been brought out for use with the apparatus so that the lag between time of photographing the scene and of placing the development on the television transmitter is ninety seconds.

Automatic Transmission Passes Rigid Tests



Four positions of the transmission, three forward and one reverse speed

Hundreds of thousands of miles service on test vehicles have resulted in adoption of the Banker automatic transmission, known as the "mono-drive," as standard equipment for fleets of buses in Chicago and New York. The unit is completely mechanical, involving no hydraulic, electric or vacuum control, pumps, valves, cylinders or switches. The only control ne-

cessary is a lever on the dash. It has three positions, "forward," "reverse," and "starting." An automatic clutch of the expanding shoe type eliminates the necessity for a "neutral" position and also eliminates the clutch pedal in the vehicle. Shifting is accomplished through the accelerator pedal. When starting from the curb, the driver merely steps on the accelerator. This engages the clutch and starts the vehicle rolling in low gear. The clutch engagement is gradual, starting at 400 revolutions per minute of engine speed and being complete at around 800 revolutions per minute. To shift into second, the driver releases the accelerator pedal momentarily and then depresses it again. The same procedure is followed in shifting into high. When the vehicle is stopped, the transmission automatically returns to low-gear position. The "mono-drive" is the planetary type in which gears not only drive other gears, but also sometimes revolve around the driving and driven gears. From this revolving, like the sun and planets, the name planetary is derived. One-way roller clutches, somewhat similar to free-wheeling units, control the power path through the various gears in the different speeds. In direct or high gear, the housing within the transmission which contains the planetary gears revolves as a complete unit. At this time all the gears are locked against rotation by means of the clutches. In reverse, the housing revolves in a direction opposite to engine rotation. From low to second gear, the shift is accomplished by centrifugal weights which engage the speed clutch at the moment the accelerator pedal is released and engine speed synchronizes with transmission speed.

Epsom Salt Proves Harmless to Grasshoppers in Test

Epsom salt proved to be non-poisonous to grasshoppers in a large scale test this year. Use of the salt as insect poison was suggested last spring after an experiment in which grasshoppers died after eating bait dosed with epsom salt. Farmers who tried this in the field, however, reported no success and new tests at an agricultural college resulted in recommendation that the usual arsenic and fluorine poisons for grasshoppers be used.

Test by Mr. Roger C. Smith, Kansas

Warner Corp. } Licensed for auto's, cars, etc.
Borg-Warner Corp. }
General Motors Truck Corp. Pontiac, Mul

Motor Coach
Fifth Avenue Coach
New York

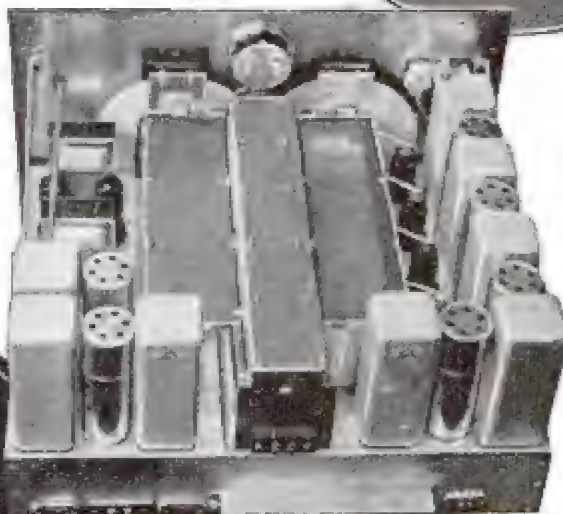
see April 1932
5985
7.24
See page 1932
combustion

Radio



Short-Wave SUPER De Luxe

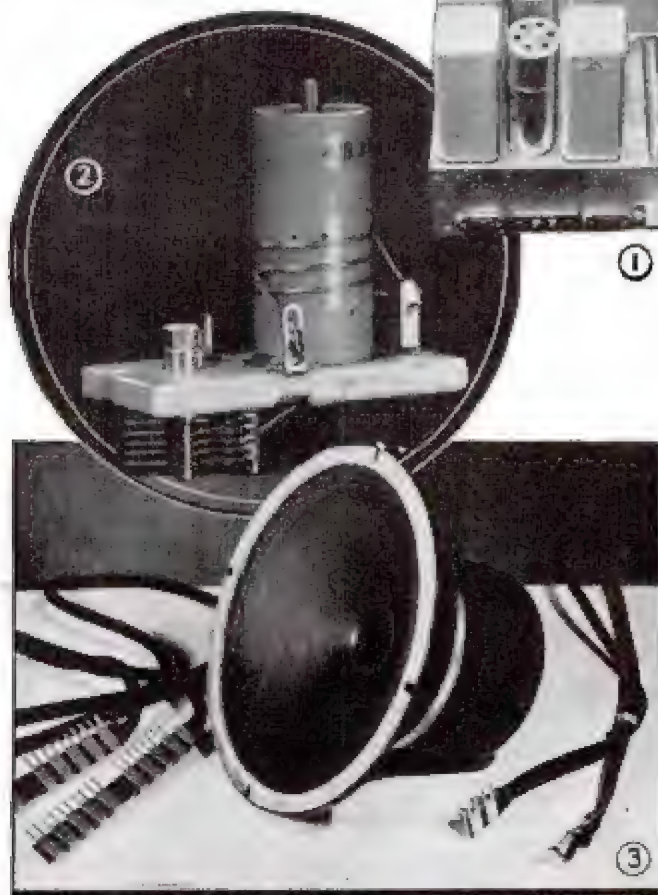
TWO stages of r.f. amplification are employed in this 16-tube ultra-high frequency superheterodyne receiver on all bands from $7\frac{1}{2}$ to 240 meters. Although designed for experienced short-wave listeners, advanced amateurs, professional operators and engineers, it is so simple to operate that a novice can usually tune in stations from any part of the world.



With a signal to noise ratio of 6 to 1 in the now popular 10-meter ultra-high frequency band, and almost total freedom from "two-spot" tuning, this new "super-pro" model includes several other special and highly desirable features. An elec-

trical band-spread system permits the 28 to 30 megacycle amateur band to be spread over 90 divisions of the dial. This affords non-critical tuning without an unnecessary amount of dial turning. Additional features include crystal filter, calibrated band width, beat oscillator, audio and sensitivity controls, stand-by switch and automatic volume control.

The rugged self-contained tuning unit is shown in photo, Fig. 1; inset photo, Fig. 2, is a close-up of the 10-meter oscillator coil assembly. All coils with their air-type trimmer condensers are rigidly mounted on isolantite bases. Lower photo, Fig. 3, shows the loudspeaker and connecting cables for a separate power-supply unit not shown in the photos.



Hammarlund *W. J. & Co.*
1124 W. 3rd St. New York

TWO-TUBE

By M. N. Beitman



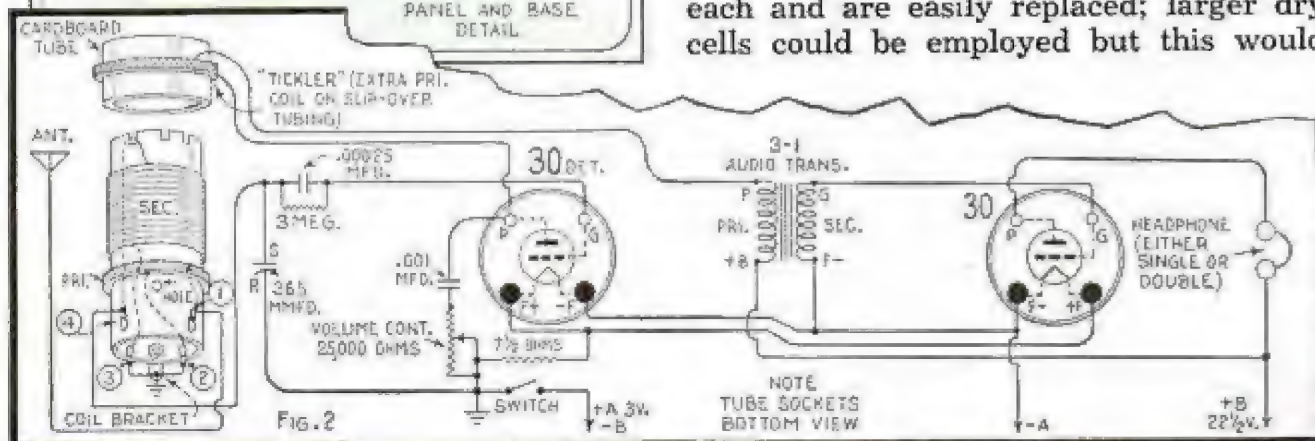
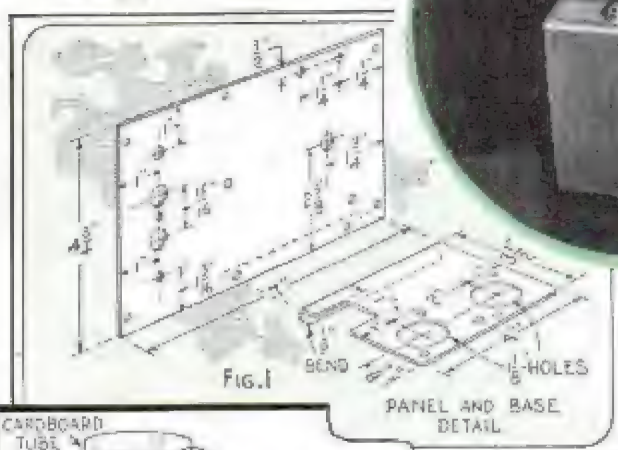
HERE is a compact easily portable 2-tube battery-operated broadcast receiver that you can take along on hikes, mount on your bicycle or operate at the ball game to listen in on the broadcast while you watch the action. As a portable emergency set this inexpensive little receiver would have a definite value in flood, hurricane or earthquake areas where power lines were not available.

No special tools or skill are required for its construction; anyone who can handle a soldering iron will have no difficulty with the assembly. All parts are standard and there are no coils to wind. Two type-30 battery tubes are used and the set is com-

pactly designed to fit into a standard instrument cabinet measuring only $5\frac{1}{4}$ by $5\frac{1}{2}$ by $7\frac{1}{2}$ in. There is sufficient room in the cover for headphones, and the batteries fit into the compartment below.

The B-battery is a small $22\frac{1}{2}$ -volt unit that will give continuous service for about 6 months. Two small dry cells of the flashlight variety, connected in series, supply A-power to the filaments

and are good for about 5 hours continuous use. These cells cost only about 10 cents each and are easily replaced; larger dry cells could be employed but this would



Note—This self-contained portable receiver is designed for small "A" and "B" batteries; however, larger external batteries may be employed for stationary operation

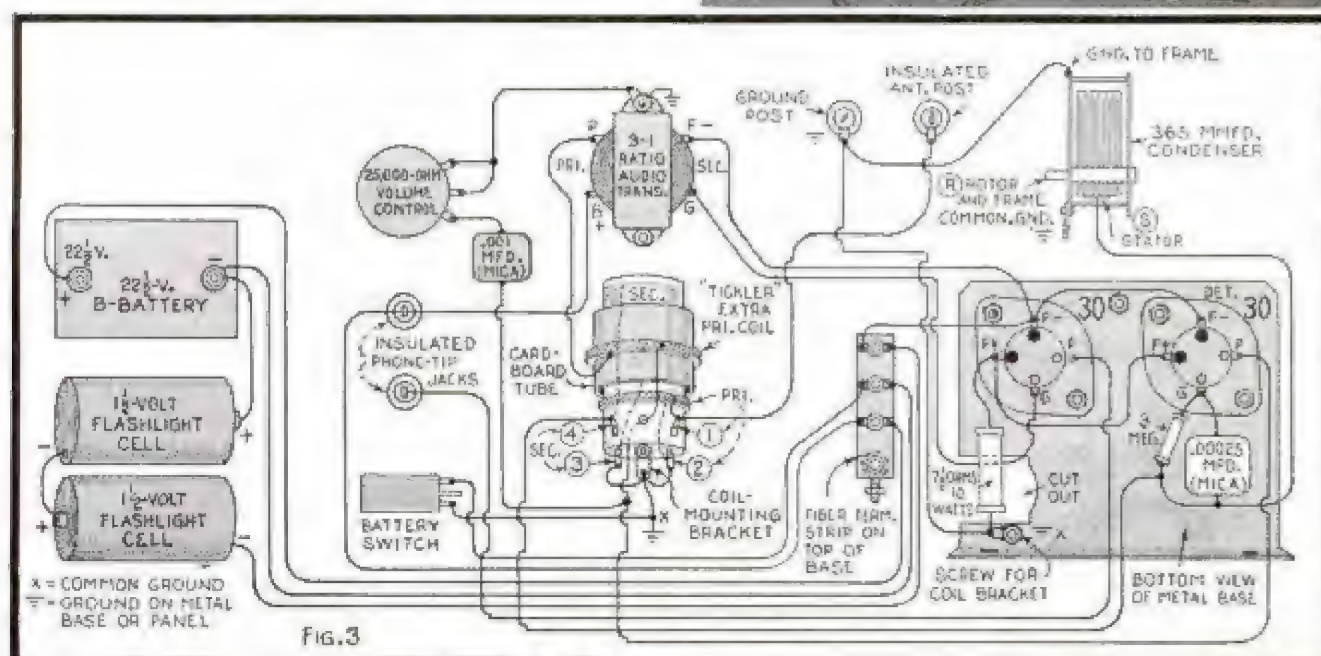
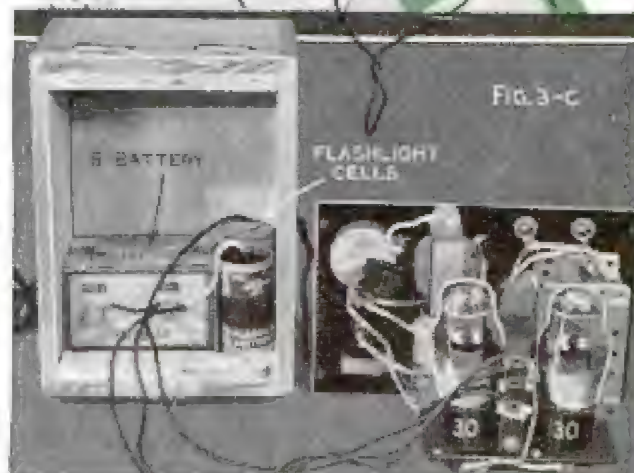
Portable EMERGENCY RECEIVER

necessitate a larger cabinet.

A regenerative detector is used in the simple circuit, with an extra primary winding serving for the tickler coil. This winding is placed on a short length of cardboard tubing which is slipped over the secondary winding of the antenna coil. Ordinary mailing tubing having an inside diameter of about 1 in. may be employed; a turn or two of paper can be wrapped around the secondary of the antenna coil, if necessary, to provide a snug fit. A little adhesive tape or collodion will hold the tickler coil in position. This extra primary or "tickler" coil must be a "slip-over" type that will fit over the cardboard tubing. The inside diameter should be about $1\frac{1}{8}$ in.

Details for the metal panel and base appear in Fig. 1; $\frac{1}{16}$ -in. sheet aluminum is used for both panel and base. As this material is difficult to solder, all ground connections to the base or panel are made with soldering lugs placed under the heads

(Continued to page 156A)



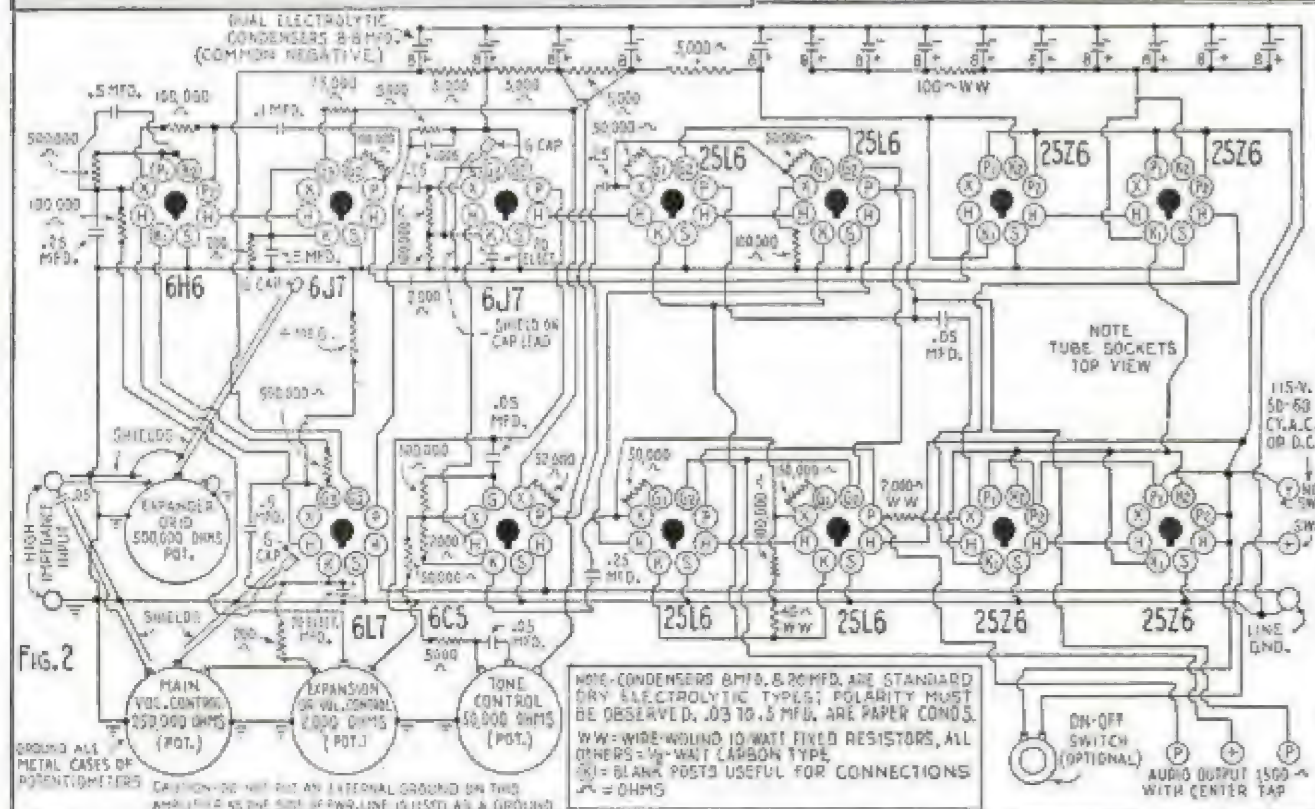
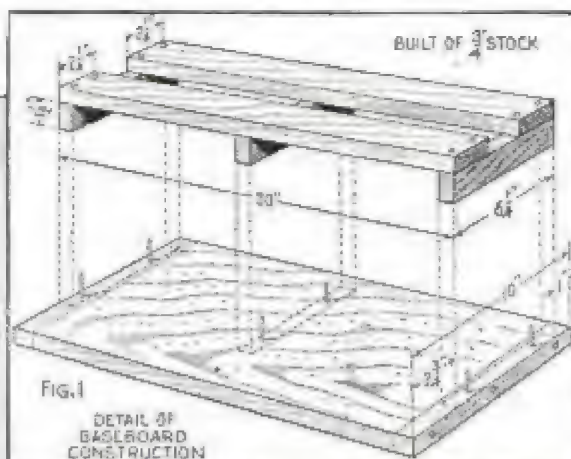
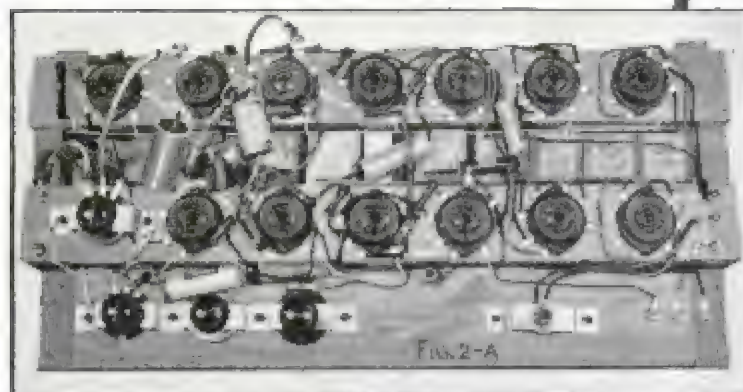
Self-Powered Seven-Watt Audio Amplifier

By R. C. Hitchcock



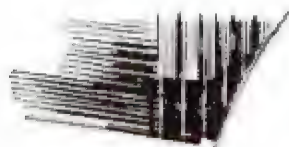
NO transformers or chokes are required in this 13-tube a.c.-d.c. audio amplifier. Suitable for dance orchestras or ordinary public address with crystal microphone or phonograph pickup in medium-sized auditoriums, it employs a 3-stage audio amplifier with parallel push-pull output stage using 4 new "beam-power" tubes plus a dynamic volume expander. Four tubes are included in the rectifier section.

Construction is quite simple as
(Continued to page 150A)

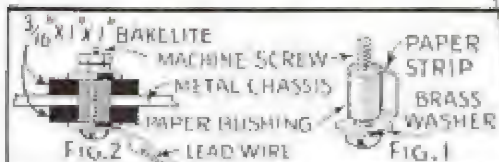


HINTS FOR RADIO EXPERIMENTERS

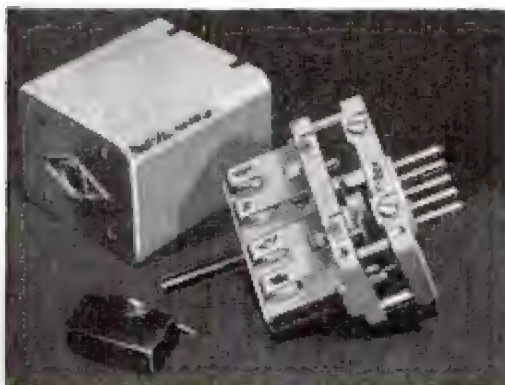
Homemade noise filter for power line eliminates interference caused by refrigerator or other apparatus operated on same line as receiver



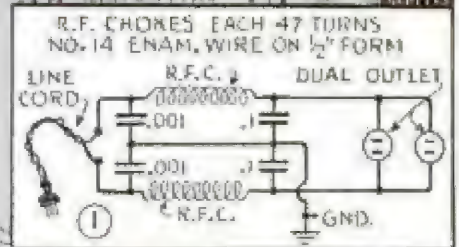
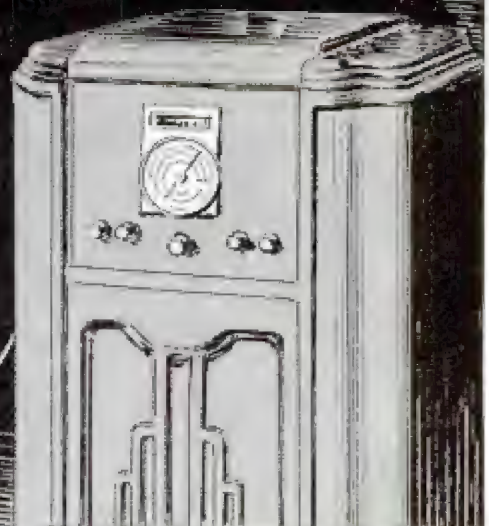
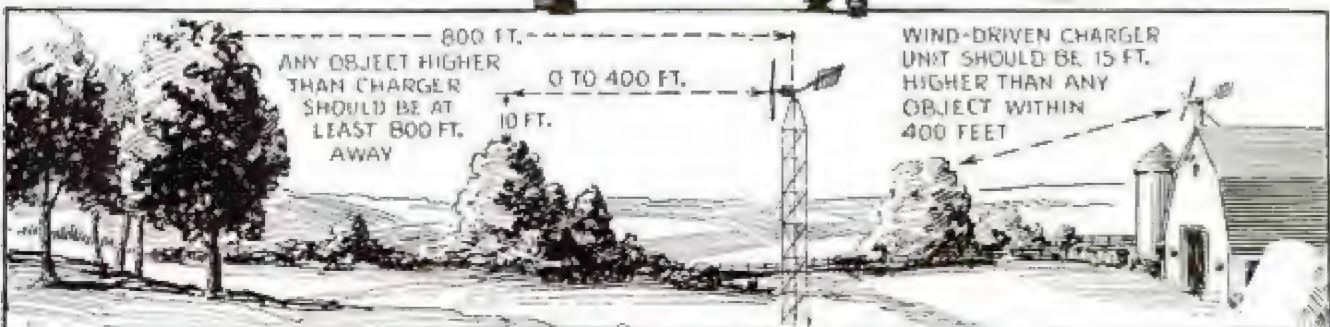
Insulating bushing easily made from paper strip and Bakelite blocks. Dip in paraffin before assembling on metal chassis



Below, multiple crystal holder for transmitter; four separate crystals selected by built-in switch. Right, spring suspension quiets battery charger; optional method, put charger on piece of asbestos placed on felt pad



Sketch below shows suggestions for installing a "supercharger" or wind-driven battery charger to obtain unobstructed sweep of wind



Below, simple method of taping the end of a wire to prevent shorts. Left, acoustical padding arrangement improves low-frequency response of older console cabinets

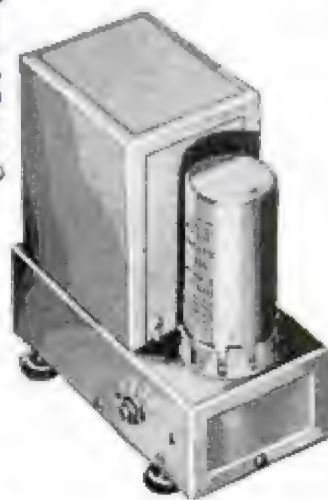


Radio Receiver Hangs on Wall



Designed to hang on the wall like an electrical clock, this radio set saves floor and table space in small offices or apartments. It is a 5-tube transformer-type a.c. superheterodyne with built-in antenna, automatic volume control and includes a dynamic speaker.

Portable Six-Volt Power Unit



Working from a 6-volt storage battery, this vibrator-type power unit delivers up to 300 volts at 100 m.a. rectified d.c. for operating portable radio transmitters and public-address systems, also converts 110-volt receivers for 6-volt operation.

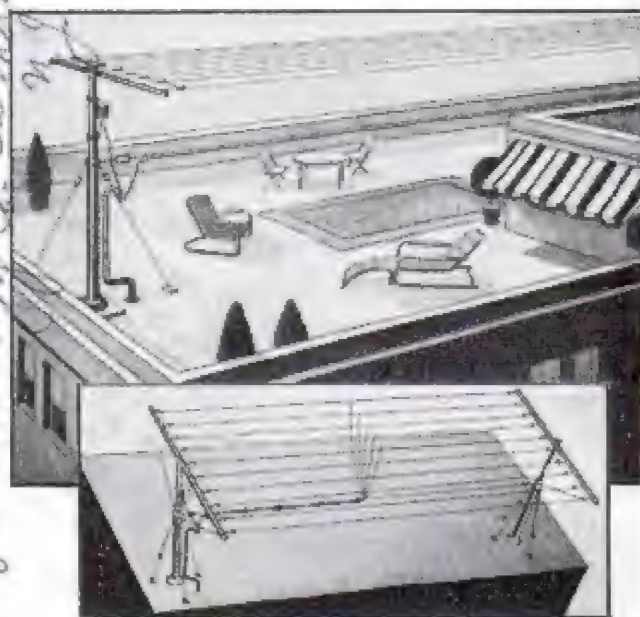
Variable Voltage Transformer

Service men can use this transformer to adjust line voltage for any requirement. It also supplies various ranges of voltage needed for testing radio sets. Ranges available are 0 to 256 in 2-volt steps or from 0 to 128 in 1-volt steps.



One Antenna Serves Many Sets

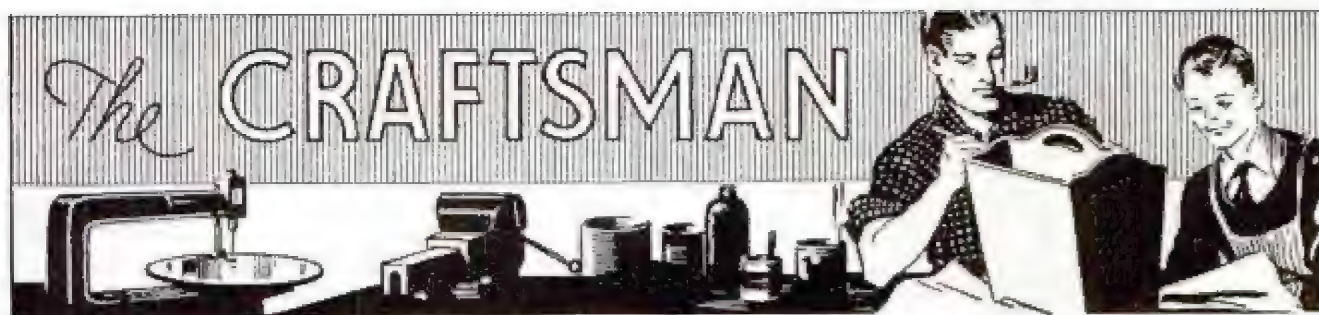
Doing away with unsightly individual antennas, this easily installed single-antenna system serves any number of receivers in an apartment building. It is claimed



to provide greatest possible pickup with minimum interference from electrically operated apparatus in the building.

Blueprints covering radio construction articles in past issues are available for 25 cents each; original material lists and additional information can be obtained from our Radio Department without charge upon receipt of postage.

NEXT MONTH—How to Build a "Beam-Power" Four-Tube Bookcase Midget. This simple little a.c.-d.c. broadcast receiver employs a type-25L6 beam-power tube and a 3-in. dynamic speaker; designed for bookcase or end table. Also, **How to Build a Five-Meter Transmitter.** RK-34 tube is used as master oscillator.

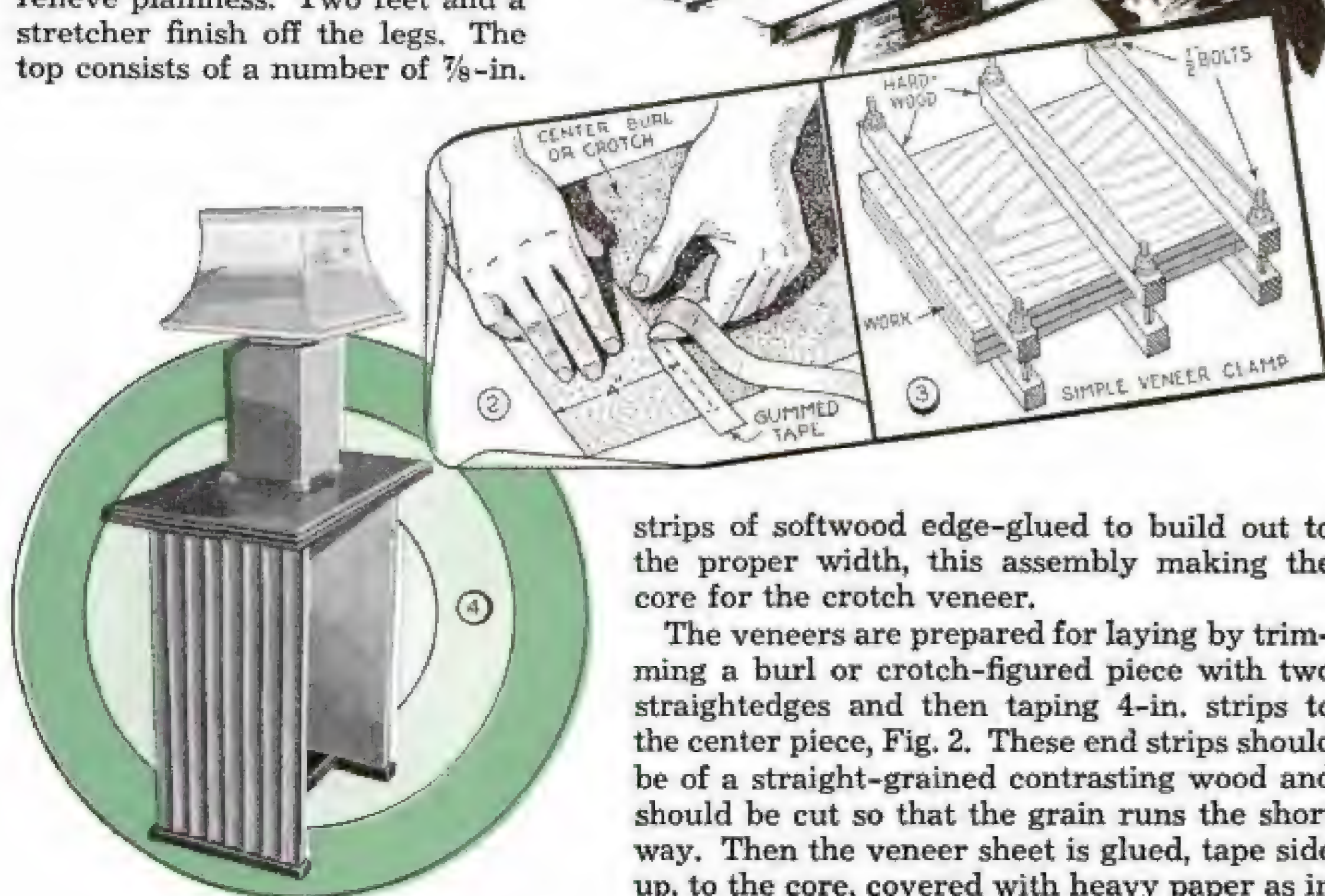


New LAMP TABLE

with matched veneer top

By WAYNE C. LECKEY

BONE-WHITE enamel in combination with fancy veneers in the natural color makes this lamp table especially attractive. Just about the minimum of stock is used in the construction. The "legs" are two pine boards, the outer faces of which are fluted to relieve plainness. Two feet and a stretcher finish off the legs. The top consists of a number of $\frac{7}{8}$ -in.



strips of softwood edge-glued to build out to the proper width, this assembly making the core for the crotch veneer.

The veneers are prepared for laying by trimming a burl or crotch-figured piece with two straightedges and then taping 4-in. strips to the center piece, Fig. 2. These end strips should be of a straight-grained contrasting wood and should be cut so that the grain runs the short way. Then the veneer sheet is glued, tape side up, to the core, covered with heavy paper as in

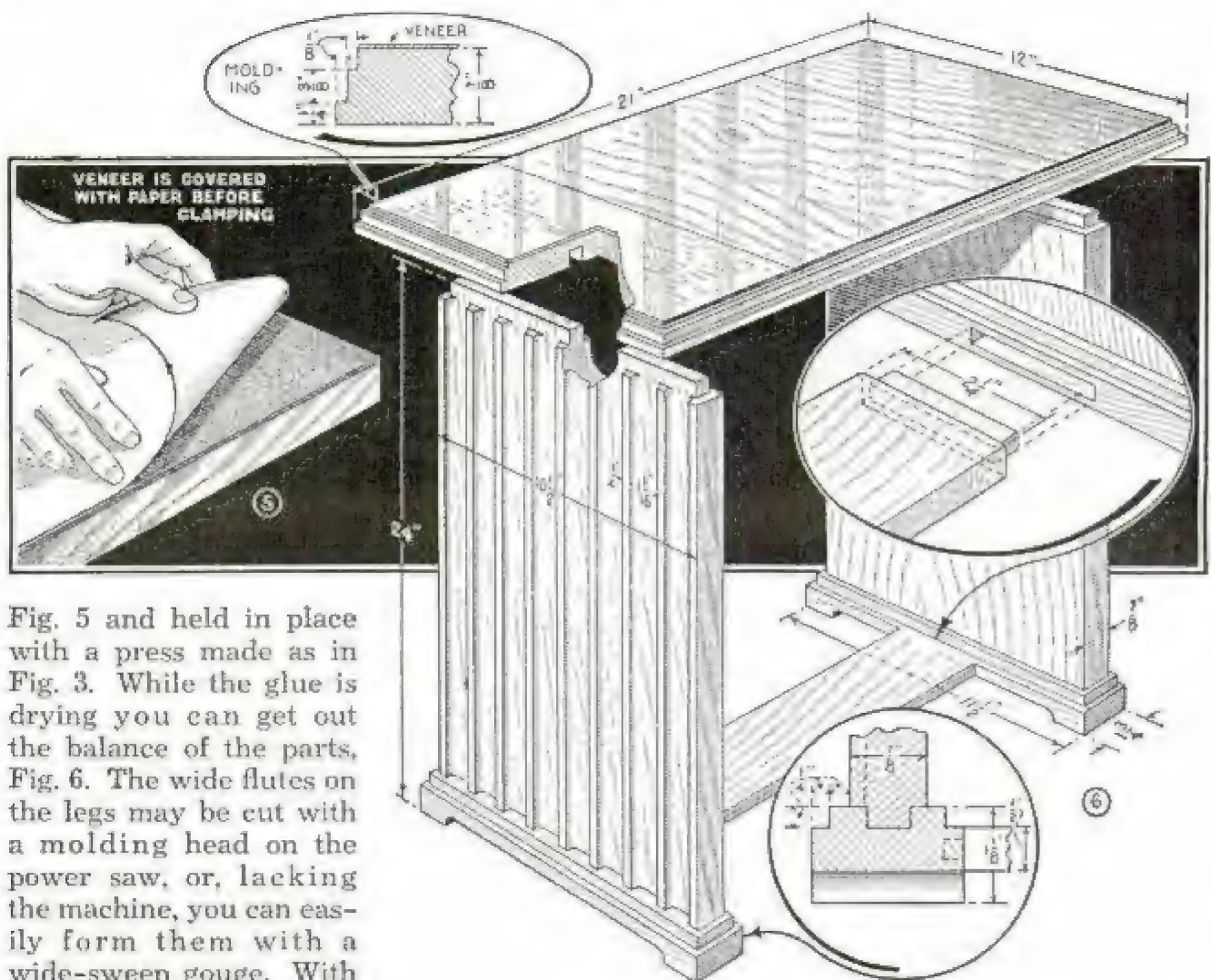


Fig. 5 and held in place with a press made as in Fig. 3. While the glue is drying you can get out the balance of the parts, Fig. 6. The wide flutes on the legs may be cut with a molding head on the power saw, or, lacking the machine, you can easily form them with a wide-sweep gouge. With the saw available, tenons are cut on the ends of the uprights and registering stopped grooves in the top and both feet, as shown. Without the machine these parts can be joined with either dowels or screws and glue. Now the top can be squared up to finished size and the edges molded. Fig. 6 suggests one style of molding which is suitable. Other designs could be worked out. This done, and the top

fastened in place, sand and finish the veneer in the natural color with filler, shellac and wax. Enamel all edges and the feet black and finish the uprights in white, taking special care that the colors do not run. Then go over the whole thing with fine steel wool to dull the surfaces to a satin gloss. For a high-gloss finish flow on a final coat of enamel.

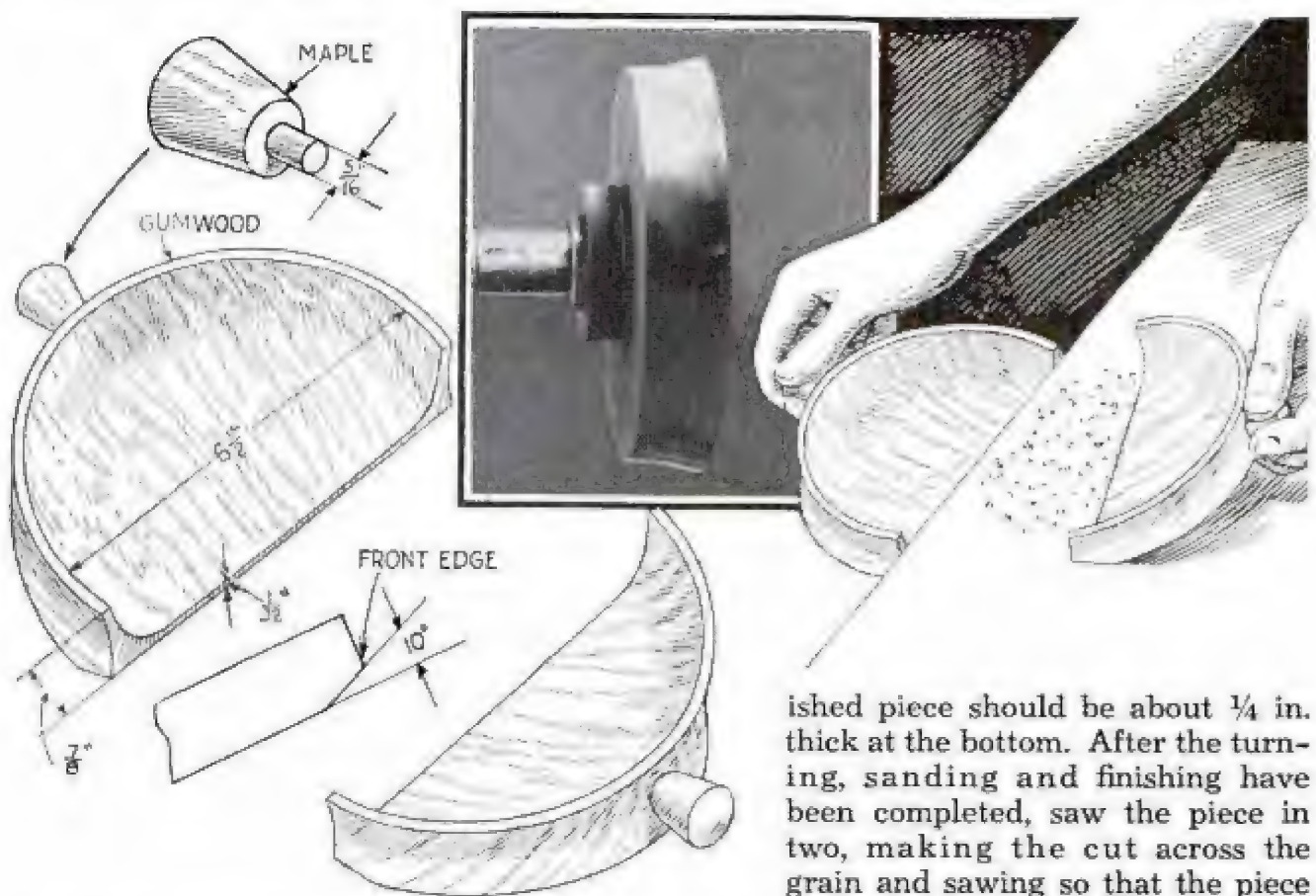
This Tinsmith's Toolbox Adapts Itself to Any Roof Pitch

In order to keep his tools close at hand while working on a roof, one tinsmith made this carrier, the box of which remains level regardless of the roof pitch. The carrier consists of a flat-iron frame between the ends of which is loosely pivoted a toolbox made from a length of 6-in. eave trough. The horizontal feet of the carrier are bent downward slightly and are pointed to prevent slipping on a roof.

❑ When a negative sticks to the print paper, it can be loosened by soaking in hypo.



Crumb Tray and Comb Turned in One Piece



Just the thing to remove crumbs from a tablecloth, this comb-and-tray set is turned in one piece from hardwood. When turning the piece, allow for plenty of waste at the back so that the hole made by the screw chuck can be turned out later. The fin-

ished piece should be about $\frac{1}{4}$ in. thick at the bottom. After the turning, sanding and finishing have been completed, saw the piece in two, making the cut across the grain and sawing so that the piece to be used as the comb is one third the size of the other. Next, bevel the undersides of the severed edges at a 10° angle so that they are about $\frac{1}{2}$ in. thick. Drill each piece at the back to take a knob or handle, which is turned as indicated.

—Dale R. Van Horn, Lincoln, Nebr.

Beehives Are Sterilized Thoroughly with Blowtorch Flame

An effective way of sterilizing beehives is to use a blowtorch. The hottest flame should be used, passing it slowly up and down the inside of the hives. Care must be taken in using the flame, of course, to avoid charring the surface of the wood. Every corner can be reached in this way and the hives are completely sterilized without leaving any disagreeable odor. All separate parts of the hive should be gone over with the flame.

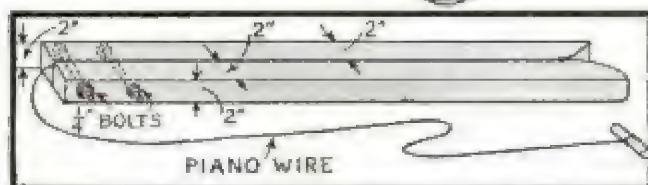
—Truman Greenwalt, Litchfield, Ill.

¶ Mixing powdered boracic acid, 5 grains, with each ounce of shellac to be used as an undercoat on wood causes the shellac to dry very hard so that it serves as a filler as well as an undercoat.



There are no germs left in cracks and corners when you sterilize beehives with a blowtorch

Composition Roofing Cut Easily by Length of Wire



This tool will cut felt roofing paper and linoleum smoothly without having to clean the cutter

The usually difficult job of cutting roofing paper, linoleum and similar material is done easily with this cutter. Made by bolting two lengths of wood together at one end, the cutter uses a length of piano wire to sever the paper, the wire being fastened to one of the bolts. In use, the wire is placed under the material to be cut and the wood strips are placed on top, after which the wire is pulled through the material as shown in the illustration.

Filler Pipe on Kerosene Barrel Telescopes for Easy Insertion

Attached to the faucet of your kerosene barrel, this telescoping filler pipe enables you to fill a stove reservoir or oil-burning heater easily. It is made from two lengths of tubing, the lower section of which is a snug, sliding fit on the upper section. The lower part is kept from dropping too far down by a stop



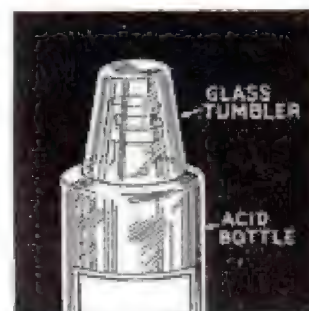
rod. When the tank or reservoir is filled all you have to do is just move the sliding section upward to remove the tank.

— Edwin Kilburn, Spring Valley, Minn.

Chemist's Glass Bottle Tops Made from Small Tumblers

I have found that small glass tumblers, obtainable at a dime store, make excellent bottle caps for the amateur chemist to protect the necks of acid and reagent bottles from dust. Used in this manner, the glasses help to prevent the contents of the bottles from becoming contaminated.

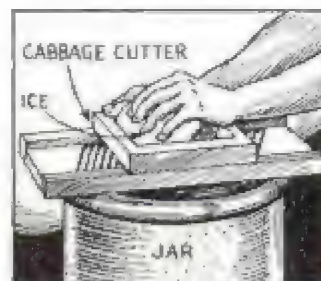
—George Vias, Chicago.



Cabbage Cutter Shaves Ice

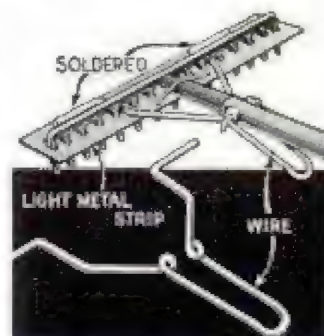
When it is necessary to cool lemonade or other beverages quickly, ice can be shaved easily on an ordinary cabbage cutter. A piece of ice is merely placed in the sliding hopper of the cutter and moved back and forth under pressure of the hand.

The ice shavings may be collected in a stone jar or similar receptacle large enough to support the cutter. —G. E. Hendrickson, Argyle, Wis.



Leaf Expeller on Garden Rake

If you use a garden rake to gather leaves from your lawn, this expeller is just the thing to free the rake teeth when they become clogged. It is nothing more than a strip of light sheet metal perforated to slip over the teeth and provided with a heavy wire handle bent to the shape



shown, soldered to the sheet metal and pivoted to the rake handle. In use, both the wire handle and the rake handle are forced together to remove leaves.

—Denver Jewell, Sullivan, Ind.

Bottle Holder for Drawing Ink Folded from Paper

When working on the drawing board and there is no holder for your ink bottle at hand, one can be made in a jiffy from a piece of fairly stiff paper. Cut the sheet $4\frac{1}{2}$ in. wide and fold it into four equal parts. Then cut a square opening in the center and fold it as shown in the photo. Next take a piece of cardboard 4 in. square and slip it under the bottle, fastening the cardboard and paper together with paper clips.



—J. F. Schindler, East Syracuse, N. Y.

Christmas-Tree Lamps Tested in Your Flashlight

When you get ready to decorate your tree this Christmas, you can test the series type of lamps in a 2 or 3-cell flashlight. The flashlight battery is not strong enough to illuminate them at full brilliancy, of course, but it will cause them to glow sufficiently to tell whether or not they are burned out.—J. T. Whitmore, Aurora, Ill.



Screw those questionable Christmas-tree lamps into your flashlight to see if they are in good condition

Reflector on Drawing Board Reduces Shadows

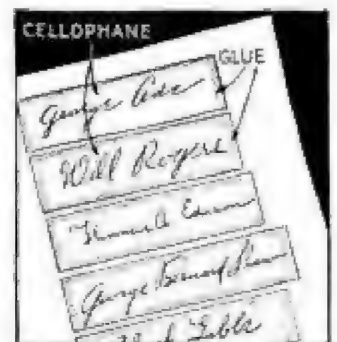


This reflector is quickly adjusted to direct a soft light on any part of a drawing board

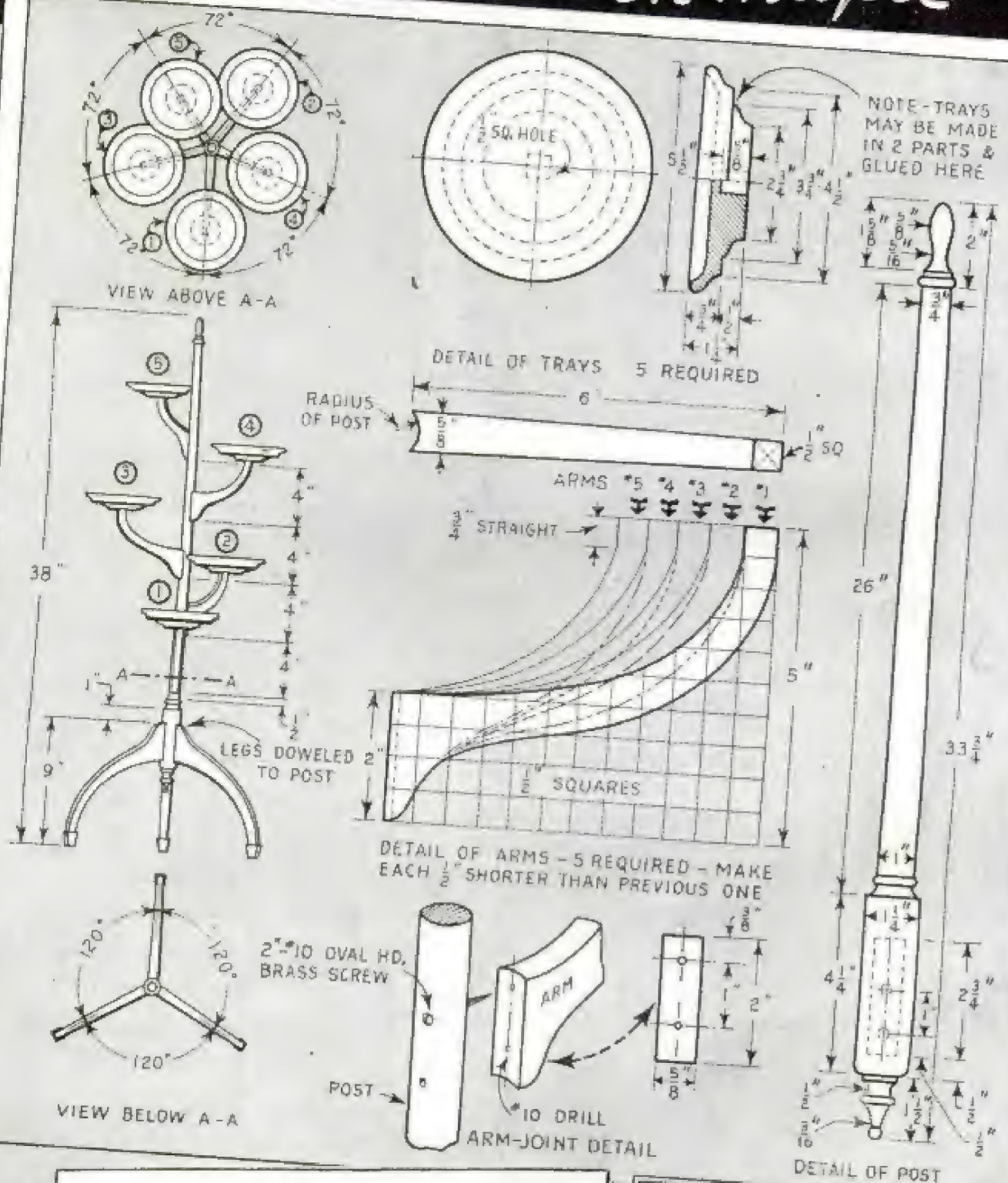
Shadows on a drawing board caused by incorrect lighting can be minimized by use of this reflector. It consists of a piece of polished aluminum or white cardboard tacked to a wood bracket, which is cut to the shape indicated in the detail. The bracket should be heavy enough to support the reflector without tipping. In use, the reflector is placed on the drawing board so that it reflects the light on the shadowed part of the work.

Autographs Are Protected by "Cellophane"

If you are a collector of autographs, the writing can be protected by gluing strips of Cellophane over the signatures. Clear Cellophane should be used and is hardly noticeable when put in place. Glue or regular Cellophane adhesive is best for attaching the strips, or you can get gummed Cellophane tape.



NEW "BLONDE" FINISH



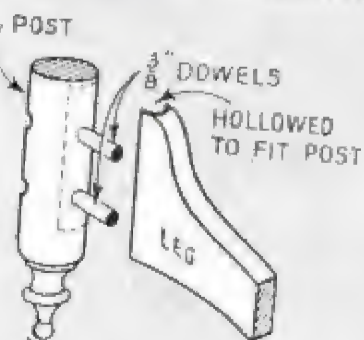
SCALE OF
DESIGNED
DRAWN BY

Holding five potted flowers, this plant tree may be used in any setting either modern or antique without detracting from its decorative value. The trays are arranged in a pleasing spiral line around the post and taper toward the top in pine-tree fashion. If the tree is turned from clear white maple, three coats of colorless varnish will produce a "blonde" finish that is so popular now

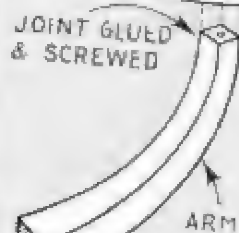
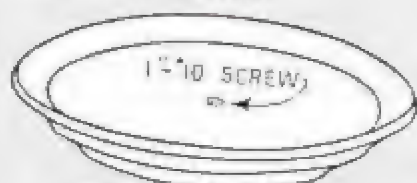
**POPULAR
MECHANICS**
MAGAZINE

PLANT TREE

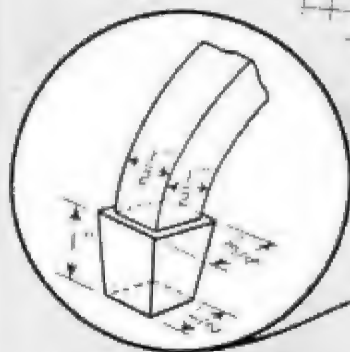
ALL PARTS CLEAR WHITE MAPLE



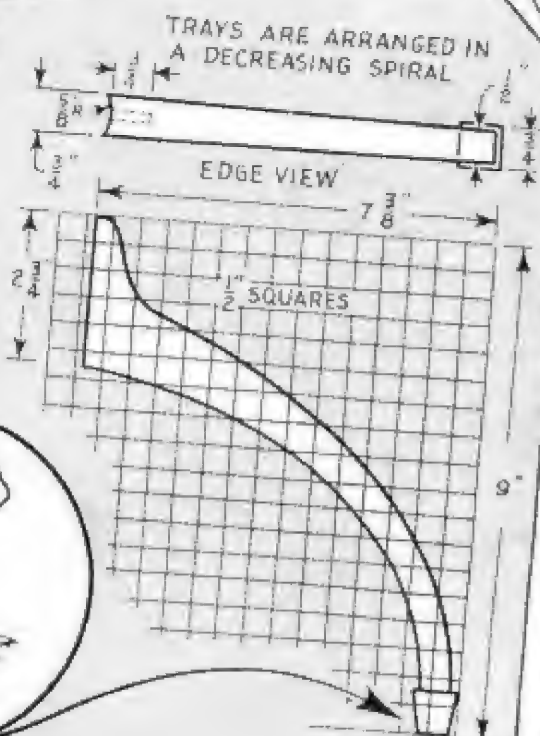
LEG-JOINT DETAIL



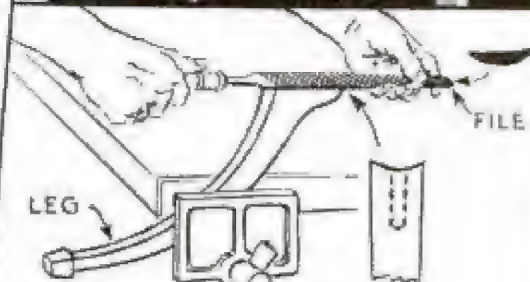
DETAIL OF ARM & TRAY JOINT



DETAIL OF SPADE FOOT



PATTERN OF LEG - 3 REQ.



AFTER DRILLING FOR DOWELS, FILE TO FIT CONTOUR OF POST



THE LEGS ARE GLUED INTO PLACE ONE AT A TIME

SHEET NO. 1

ISSUE

POPULAR MECHANICS MAGAZINE
200 E. ONTARIO ST. CHICAGO

BLUEPRINT No. SN 973

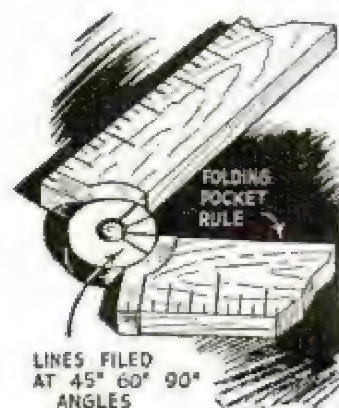
Baby-Carriage "Saddle Bags" for Shopping Trips



If there isn't room in the baby carriage, these bags will hold your packages

Busy mothers who must wheel the baby to the store to do the day's shopping will find that these bags are just the thing in which to carry packages. Joined with a leather strap or a strip of heavy canvas, the bags are hung across the carriage as indicated. You can make them of heavy canvas.—Opie Read, Jr., Chicago.

Protractor Scribed on Rule Joint Handy for Many Jobs



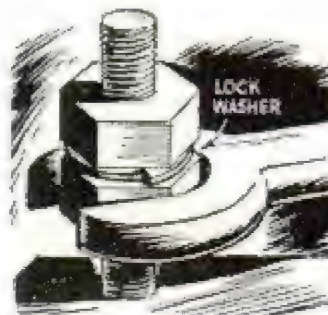
LINES FILED
AT 45° 60° 90°
ANGLES

You'll find many jobs where a simple protractor scale scribed on one joint of your folding rule will come in handy in figuring angles. The scale is laid out with the aid of a protractor, lines

being marked to indicate 45, 60 and 90-degree angles. Lines to indicate angles between these can be made, of course, if your work requires them.

Removing Tight Stud Bolts

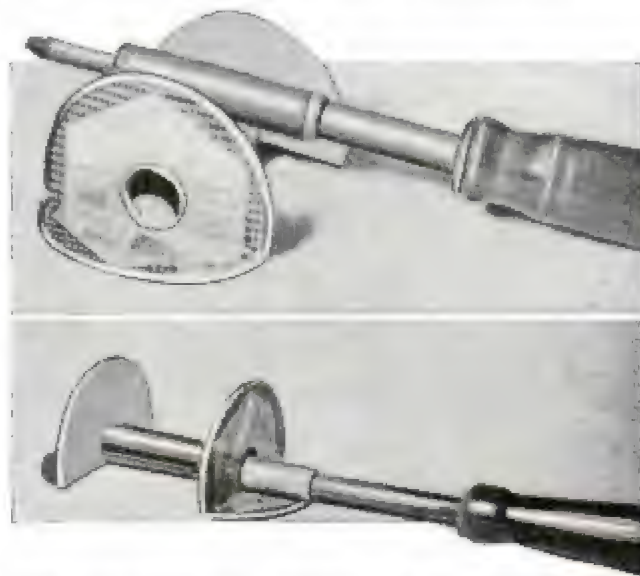
When removing a stud by means of two nuts locked together on the threads, place a spring-type lock washer between the nuts and there will be less possibility of damaging the threads. The washer keeps the nuts separated so that if they should both happen to turn together on a tight-fitting stud, there are two or three threads between them which help prevent stripping.



Soldering Iron Rest from Spool

If you have an empty wire solder spool at hand, it is quickly converted into a rest for a soldering iron. For a large iron, just bend the lower sides of the spool flanges outward to prevent it from rolling, and then lay the iron on the spool as shown in the upper detail. If you are using a small iron it can be inserted inside the spool as indicated in the lower detail. Using a spool in this manner not only provides a good rest but it also helps to conserve the heat of the iron.

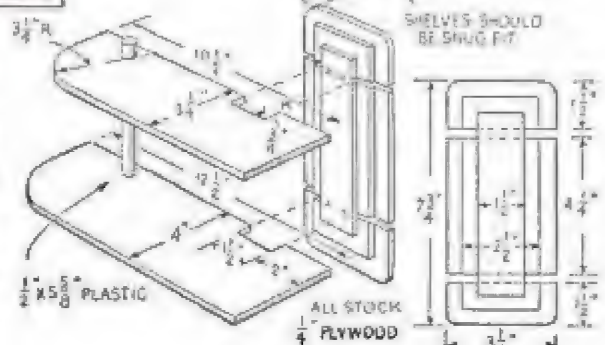
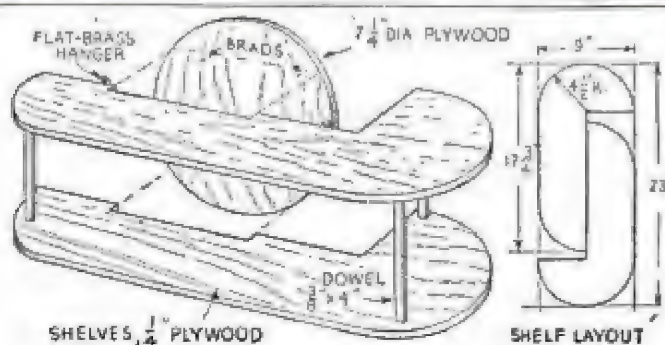
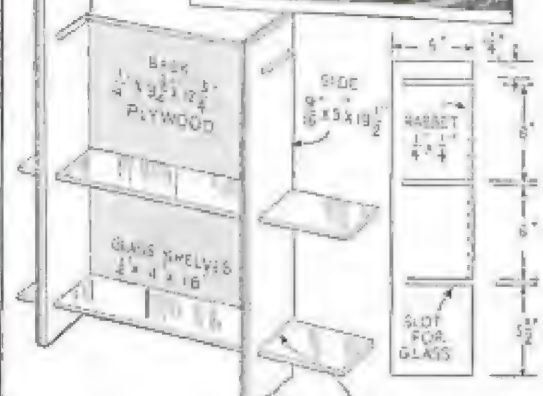
—R. C. Hitchcock, Upper Montclair, N. J.



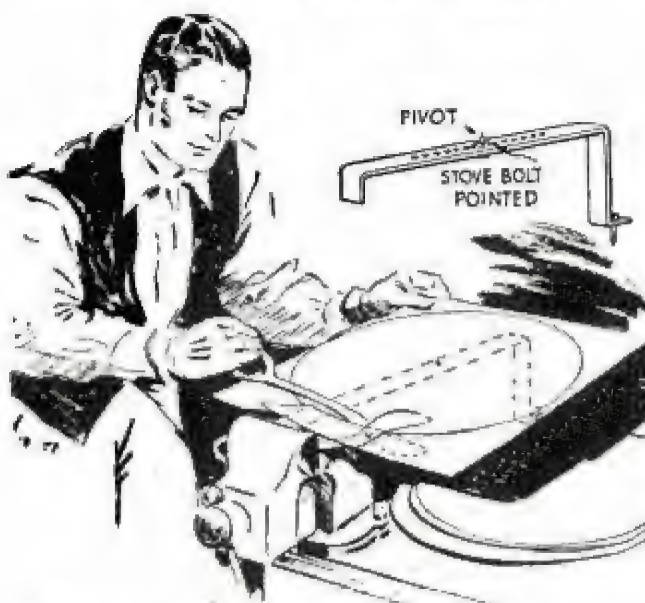
Bend the flanges of a wire solder spool at right angles and you have a rest for your soldering iron

3 Little SHELVES

Any one of these attractive wall-shell units can be made in one evening. The glass for the shelf at the right is regular shelf glass obtainable at a dime store. The two lower shelves are made of $\frac{1}{4}$ -in. plywood. Notice how the wood is laid out for jig-sawing the outside corner shelf without waste. All the shelves are finished with paint or lacquer to suit. The edges can be painted black or in a contrasting color if desired



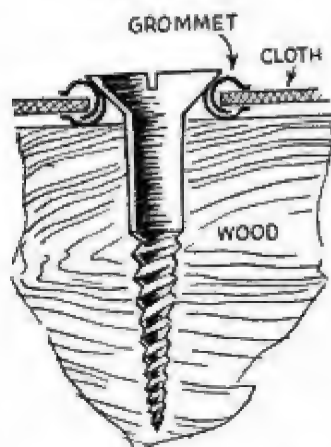
Sheet Metal Is Rotated on Pivot to Cut Duplicate Disks



Sheet metal rotated on adjustable pivot bolt to cut disks of almost any desired diameter

Difficulty of following scribed circles on sheet metal to cut a number of disks, caused one workman to rig up this simple centering device. It consists of a length of flat iron bent to the shape indicated and drilled at $\frac{1}{2}$ -in. intervals to receive a pointed stove bolt, which serves as a pivot for the work. In use, one end of the device is screwed to the bench top and the other end is held in a vise along with one handle of the shears. The metal sheets are center-punched and each one in turn is placed on the pivot bolt to be rotated at the desired radius while the shears are operated.

Applying Grommets to Sails



Here is an easy method of applying grommets to sails, tarpaulins and other material. Take a wood screw having a body of a size to slip easily through a grommet and drill a hole in a wood block to take the screw. To apply a grommet, arrange it in the hole in the cloth, and then place the assembly over the hole in the block. Next insert the screw and drive the head down on the grommet

with a hammer. The screw should be hammered almost flush with the top of the grommet to give a tight job.

—D. G. Ellson, New Haven, Conn.

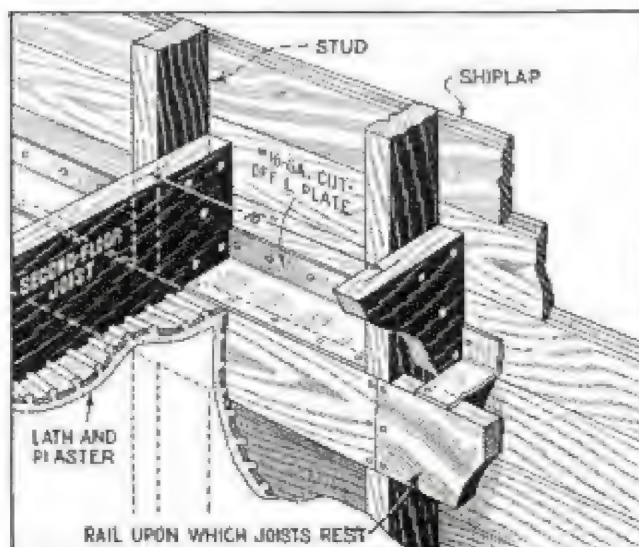
Screen-Wire Spreader for Glue

On many jobs a small square of screen wire tacked to a stick makes a better glue spreader than a brush. When dipped into the glue pot, the meshes of the wire fill with glue, which can then be distributed evenly on the work.



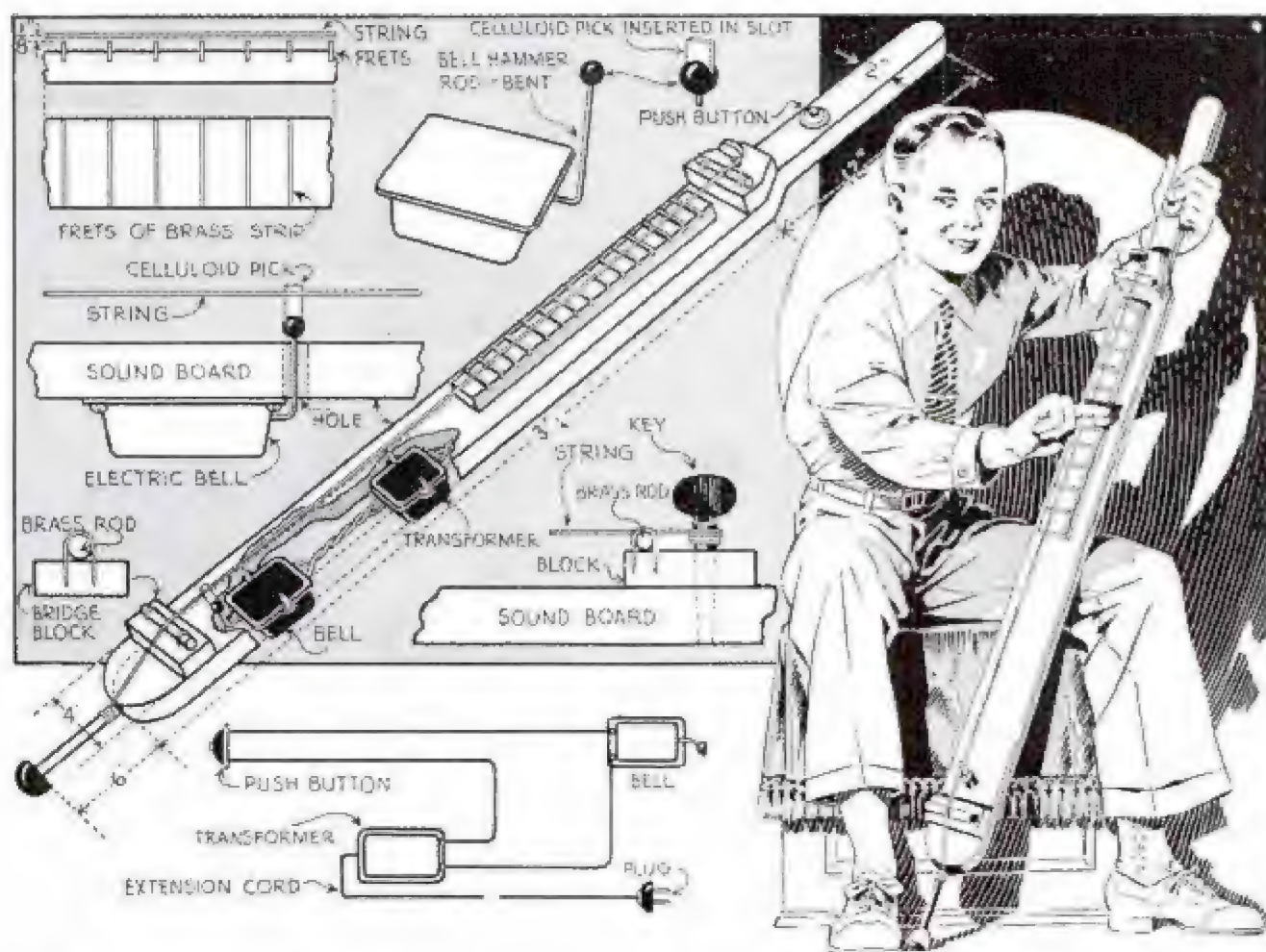
Fire Stop Between House Studs of "Balloon" Type Frame

When building a house that is to have a "balloon" type frame, which consists of running the studs full height of the walls, and it is desired to eliminate the flue effect between the studs resulting from this type of construction, a fire stop can be provided as indicated. The stop consists of strips of sheet metal installed on the joist rail at the second floor to close the air space between the studs. The metal is bent at right angles and is nailed to the sheathing and also to the rail on which the joists rest.



Sheet metal strips between studs seal off air space and prevent fire hazard caused by flue effect

Electricity Plays This One-String 'Vibro' Fiddle

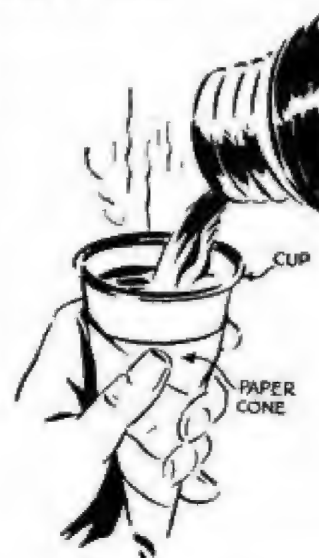


Here's a one-stringed musical instrument that can be played wherever 110-volt current is available. Principal parts required are a sounding board, a steel guitar string, a doorbell and transformer with push-button switch and a few odds and ends of brass and steel rod. The sounding board is a length of $\frac{3}{4}$ -in. pine, 48 in. long and 4 in. wide. One end is tapered for a comfortable handhold, the other rounded as shown. A hole in the lower end of the board takes a 6-in. length of steel rod, one end of which is fitted with a rubber chair tip. Blocks of softwood form a bridge for the string, which is tensioned with a key taken from an old banjo or guitar, and fitted into a tapered hole in the upper block. The fret board is of thin wood grooved at right angles for strips of sheet brass all cut to exactly the same width. These are placed at distances to give the proper pitched notes of the scale. Some experimentation will be necessary due to variations in the sounding board. The ball of the striker is slotted to take a celluloid pick as shown. The switch con-

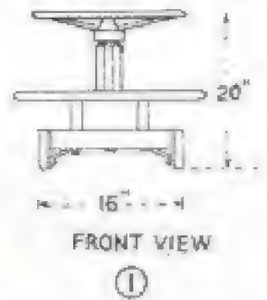
trols this action nicely. Holding down the push button slurs the notes, while releasing it between notes gives a staccato effect.

Paper Cone Holds Bottle Cap to Serve Hot Coffee

When hot coffee is carried in an insulated bottle, and no extra cup or container is at hand in which to serve it, a piece of paper from the lunch basket may be rolled to form a cone into which the bottle cap will fit quite snugly. With this holder, which keeps it from burning the hand, the cap will provide a convenient and comfortable cup for the purpose.



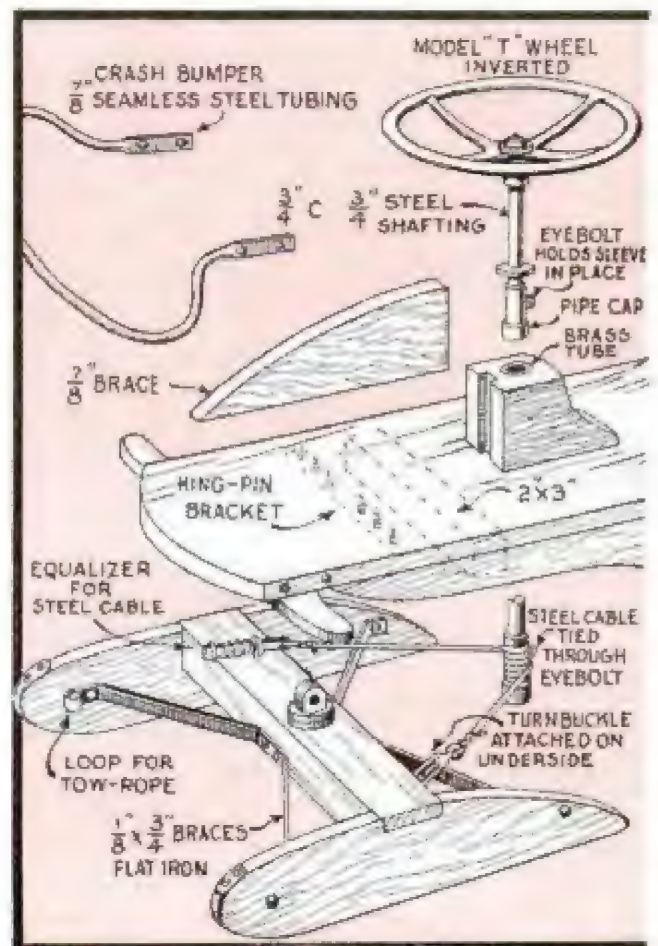
Express Ride ON THIS



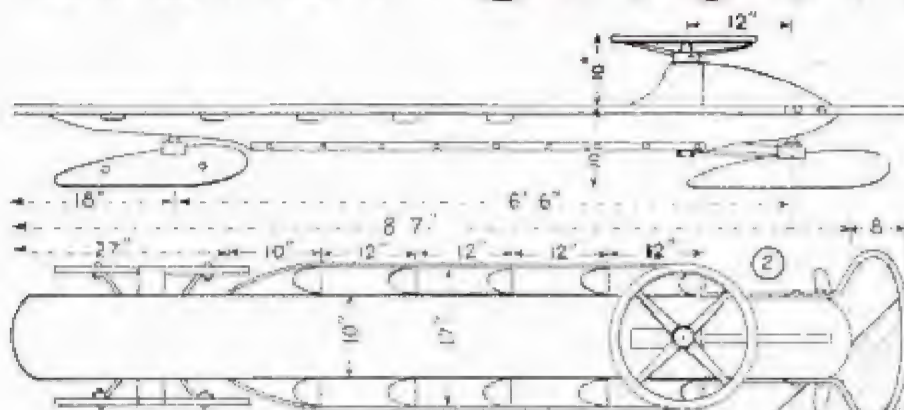
SAFETY features are built right into the streamline design of this speedy bobsled. The steering cables are always taut; feet, legs and arms of the passengers are lower than the seat and are protected by a heavy metal-faced guard which also serves as a footrest; a box-type body gives rigidity and strength combined with light weight, while a low center of gravity holds the liner true on its course at top speeds. Although this is a six-passenger job, it can be made to accommodate eight passengers, or cut back for only four persons without altering any dimensions save the over-all length.

General details are given in Figs. 1, 2 and 3. Assembly of the body is shown in Fig. 3, along with a sectional view of the box construction. Use brass or galvanized screws, with the heads countersunk, and waterproof casein glue in all joints. The bulkheads are of $\frac{7}{8}$ -in. pine. Side members are of $\frac{3}{4}$ -in. pine with handholes spaced at 12-in. intervals as shown. To these are screwed the footrests, made up of individual pieces to simplify sawing. The strap-iron guard rail is screwed along the outside. For the steering assembly mount a steering wheel from a model-T Ford on a steel shaft. On the lower end, to increase the diameter only, fit a short section of pipe with a cap on the lower end. An eyebolt without nut is screwed into this and the shaft. This eyebolt also serves to keep the cable from slipping. A section

of brass tube is installed in the upright block for a bearing as in Fig. 3. The curved wood brace is rabbeted into the upright block, and fastened with long screws up through the seat board. For the bumper a

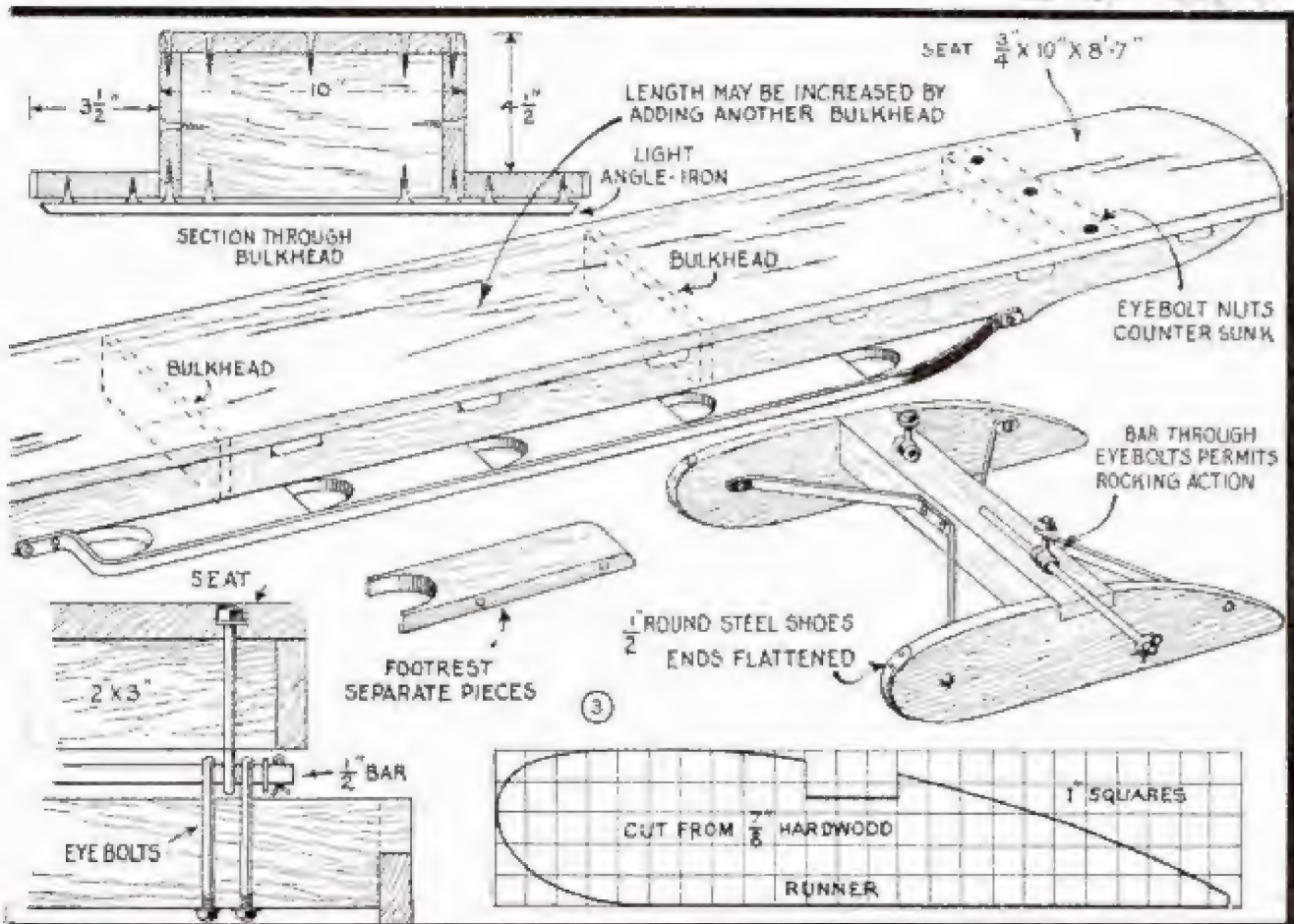
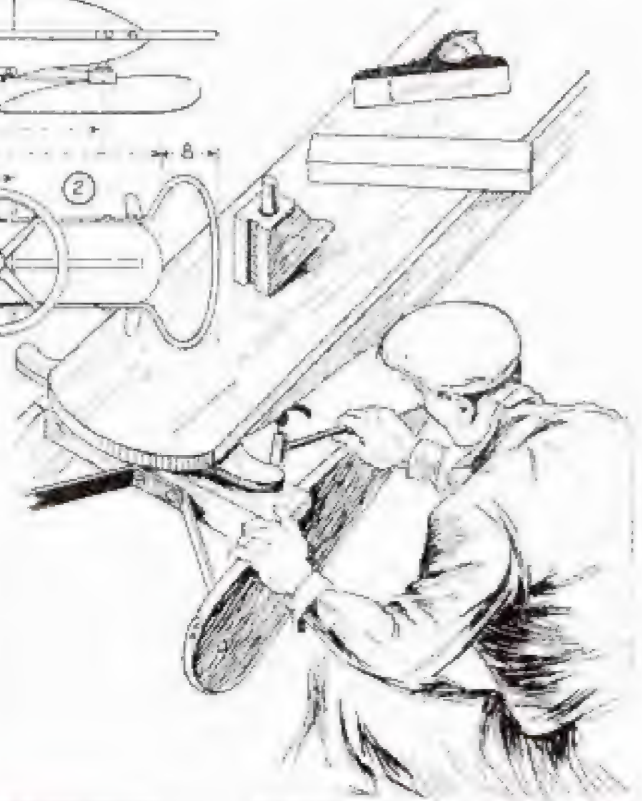


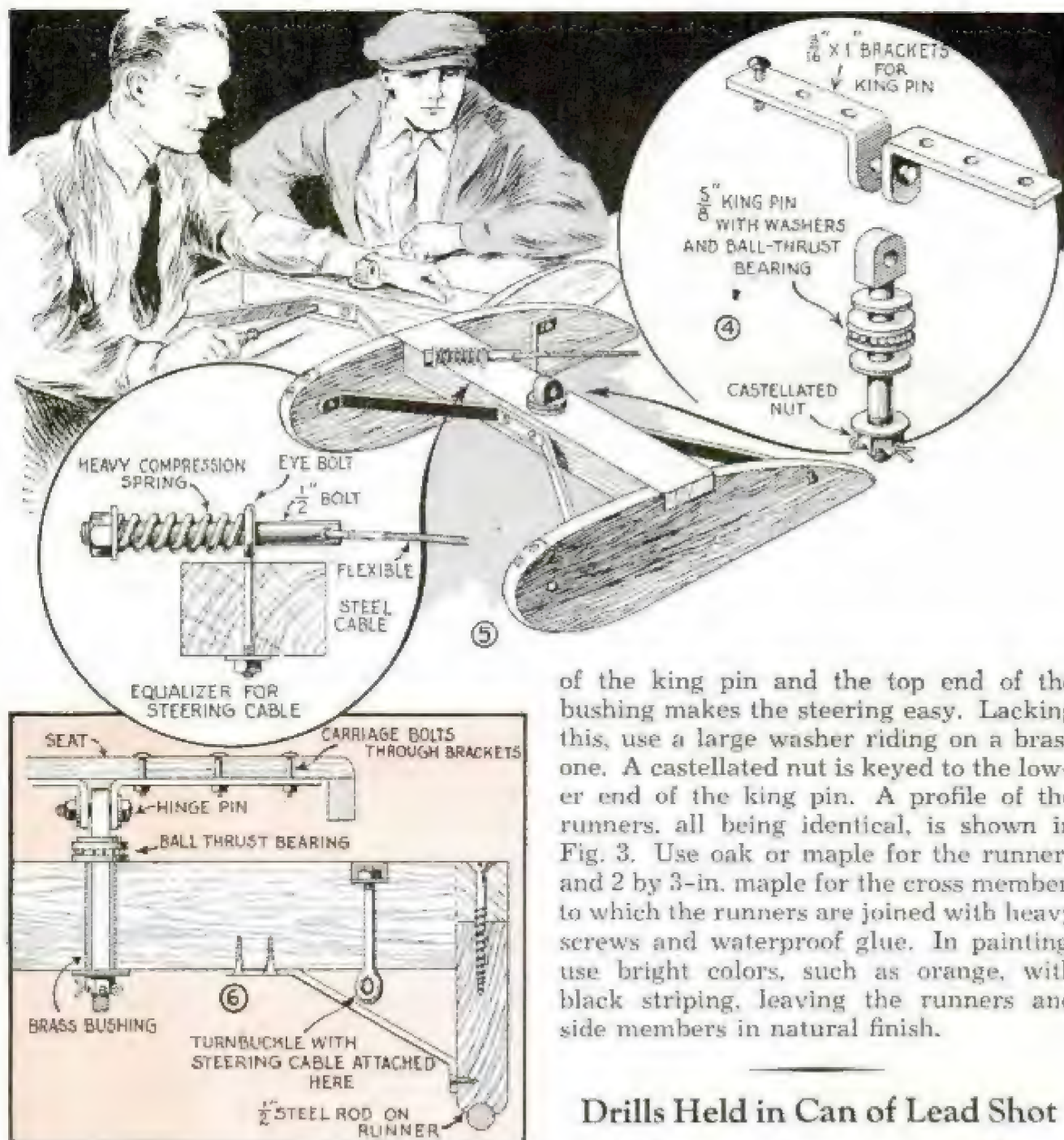
STURDY "SNOWLINER"



steel tube is bent to the form shown, flattened at the ends and fastened to the seat with heavy screws.

The front pair of runners is assembled as shown in Fig. 5, strongly braced and fitted with round steel shoes, flattened and screwed at the ends. The shoe fits in a groove about $\frac{1}{4}$ in. deep, Fig. 6. Note that the steering cable is connected on top of the cross member at one side and at the bottom on the other, so the cable will not





climb on the steering shaft. A turnbuckle is inserted at one end, and the other is connected with an equalizing coil spring, so that the cable will be under tension in any position. Use a $\frac{3}{16}$ -in. woven-steel cable.

The front runners oscillate by means of a bracket made of two angles and attached to the bottom of the seat. A bolt through the two halves of the bracket and the flattened top of the king pin forms the pivot, as in Figs. 4 and 6. The king pin can be made by flattening the head of a $\frac{5}{8}$ -in. machine bolt, then drilling for a $\frac{1}{2}$ -in. hinge pin. The king pin turns in a brass bushing, Fig. 6. A ball thrust bearing between the head

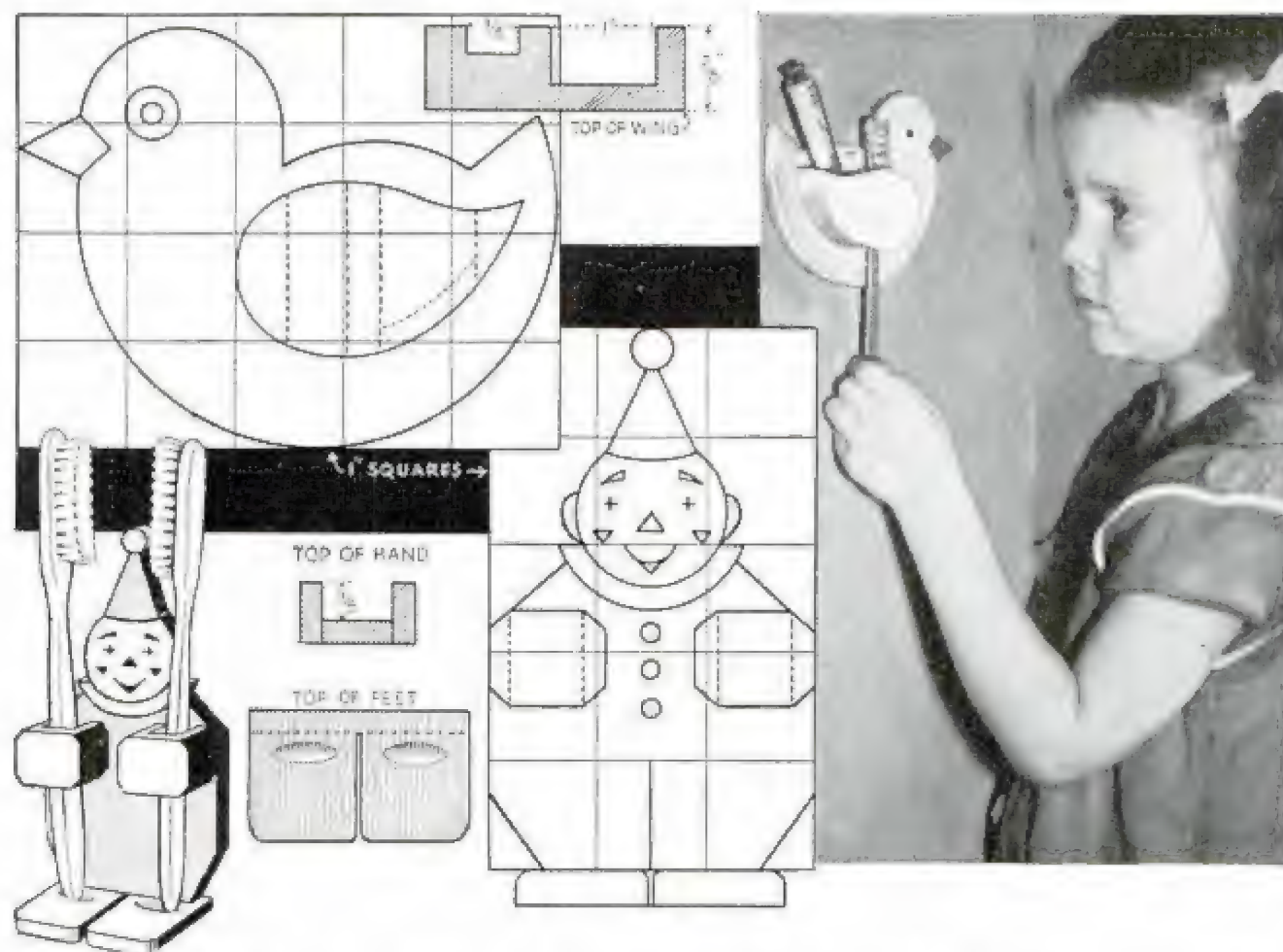
of the king pin and the top end of the bushing makes the steering easy. Lacking this, use a large washer riding on a brass one. A castellated nut is keyed to the lower end of the king pin. A profile of the runners, all being identical, is shown in Fig. 3. Use oak or maple for the runners and 2 by 3-in. maple for the cross member, to which the runners are joined with heavy screws and waterproof glue. In painting, use bright colors, such as orange, with black striping, leaving the runners and side members in natural finish.

Drills Held in Can of Lead Shot

Filled with small shot, a can or glass makes a good holder for your twist drills. This holder is heavy and is not easily upset, and a little oil dropped on the shot will help keep the drills from rusting. The can of shot also has an advantage over the usual type of holder in that the drills can be inserted anywhere without stopping your work to insert them carefully in holes.



Novel Toothbrush Holders for Small Children



This little bird tucks a toothbrush and a tube of paste under its wing, while the comical clown teasingly holds two brushes in his hands and the paste on his feet. Both figures are scroll-sawed from $\frac{1}{4}$ or $\frac{3}{16}$ -in. stock. The bird's wing is notched on the inner surface for the brush and paste before gluing it in place. Hands of the clown are built up as indicated, while the feet are shaped from one piece, depressions being made in the top surface of the feet to take the ends of the toothbrush handles.

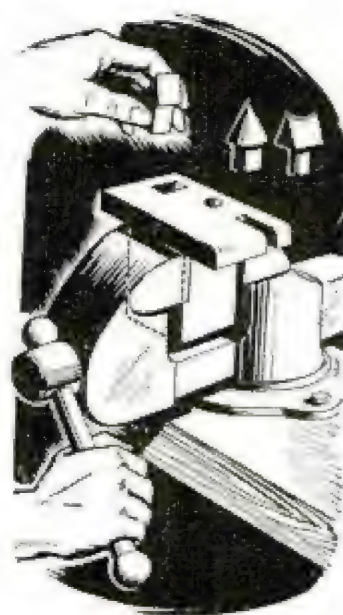
Mixture for Gilding

Equal parts of clear lacquer and lacquer thinner form an excellent vehicle for metal powders such as brass, copper, bronze and other colors used in gilding. Mix a small quantity of the powder, about a teaspoonful, with the two liquid vehicles to form the desired consistency. The mixture can be applied with a camel's-hair brush on all surfaces as readily as paint. It covers well and dries very quickly.

—Charles B. Barr, Stratford, Conn.

Simple Attachment Converts Vise to an Anvil

The home-workshop owner who has a bench vise can convert it into an anvil for light work with this homemade attachment. It is cut from a piece of steel to the shape indicated so that it can be gripped in the vise with the flat surface projecting above to take the various cutting tools.



When streets and sidewalks are covered with ice, it's a good idea to stick a strip of adhesive tape crosswise on the soles of your shoes to keep from slipping. Friction tape can also be used for this purpose.

Tubes of Paint Are Identified by Color Tags



Soiled tubes of artist's colors quickly identified by use of color tags

Artists and others who use colors in tubes and have trouble identifying them after they have become soiled, will find that color tags are helpful. The tags are cut from cardboard and tied to the necks of the tubes, after which a little of the color is put on the tags. With this method, a glance at the tags will show you which tube to pick up.

Christmas Tree Flameproofed with Sodium Tungstate

If you illuminate your Christmas tree with candles, why take a chance of it catching fire when it's so easy to flameproof it with a strong solution of sodium tungstate? The solution can be applied to the tree effectively with a common insect sprayer and does not alter the



appearance of the tree in any way. When the latter is treated it will stand considerable exposure to a flame before burning. If it does burn, however, it will not blaze

but simply char. The tree should be sprayed and allowed to dry a day or two before putting it in use.

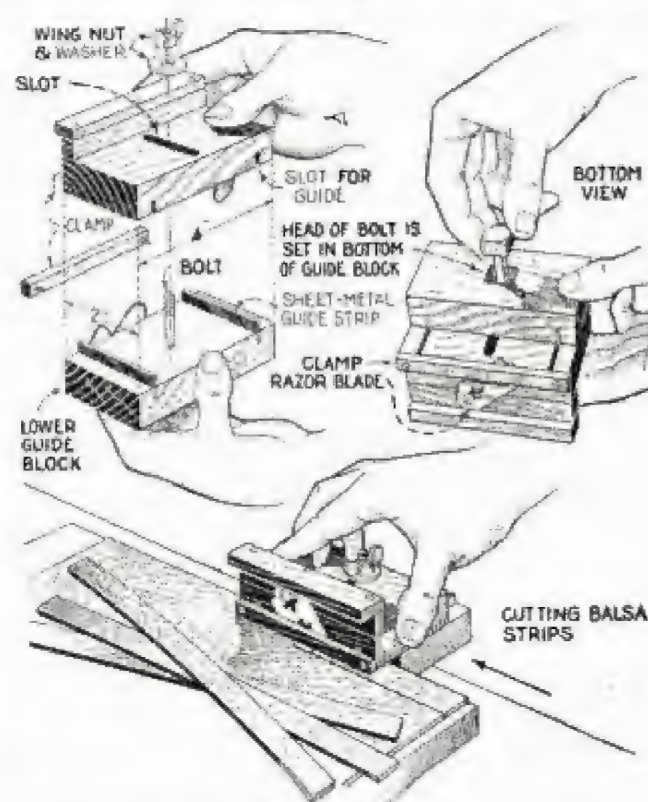
How to Remove Rust Stains from White Cloth

Rust spots can be removed from undyed cloth by soaking the spots in a solution of tin chloride, 2 oz., in water, 1 gal. As soon as the spot has vanished, rinse the material thoroughly in a large volume of clear water. This method should not be used on colored cloth.

Cutter for Thin Balsa Wood Utilizes Old Razor Blades

Just the thing for the modelmaker, this adjustable cutter will cut thin balsa wood into strips of almost any width desired. Assembled from wood blocks and an old safety razor blade as indicated, the cutter can be made any size needed. In use, the thin wood is laid on a table, bench or block of wood having a true side, which is used as a straightedge in guiding the cutter. If desired, a scale can be drawn on one end of the upper block as a guide in adjusting the width of cut to be made.

—Edward Hartel, Jamaica Plain, Mass.



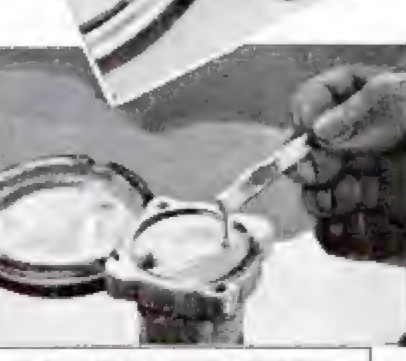
Modelmakers will find that they can cut thin balsa into any size of strips needed with this cutter

Litharge CEMENT

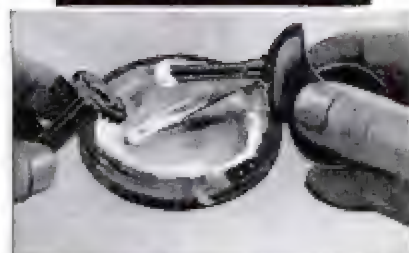
*has many
household
uses*



SIGN LETTERS ATTACHED TO GLASS . . .



RE-CEMENTING THREADED SHELL OF ELECTRIC LAMP BULB . . .



"SHIMMING" LOOSE FURNITURE CASTER



PLAIN OR COLORED PUSH PINS . . . MADE BY DIPPING HEADS OF PHONOGRAPH NEEDLES IN CEMENT



LASTING REPAIR FOR TABLEWARE



CEMENT "STEREOTYPES" MADE IN METAL-CASTING MATS .

WHEN finely powdered litharge, a form of lead oxide, obtainable at most drug stores, is mixed into a thick paste with glycerine, it quickly hardens into an adhesive, stonelike mass that requires a hammer and chisel to remove it. Although it has many industrial applications, the uses to which it may be put around the house and shop are not generally known. In addition to those shown, it is effective in filling cracks in stoneware, concrete and marble, in building aquariums and for similar purposes. In order to color it, mix the dye with the glycerine before adding the litharge. By partly mixing the plain cement with a portion of colored, a mottled appearance simulating marble is secured. Clean tools and mixing dish immediately, as the cement is difficult to remove once it has set.

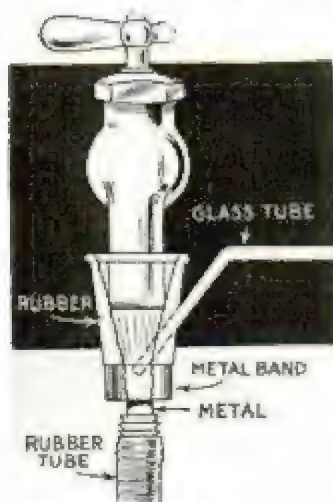
Index Pin on Drill-Press Jig Is Self-Engaging



Boring jig on drill press has self-engaging indexing pin for boring evenly spaced holes

When drilling a series of evenly spaced holes on a drill press, one craftsman fitted his boring jig with an indexing pin, which he improvised from a window spring bolt. The spring action of the plunger permits the pin to self-engage in each preceding hole as the work is advanced. By rounding the nose of the pin slightly, it will locate in the hole more readily. In production work, the pin will speed up operation considerably.—Wayne C. Leckey, Aurora, Ill.

Aspirator from Dime-Store Faucet Connector



drill a small hole into one side of the connector at a 60° angle to take a small glass

Having need of a cheap aspirator at my chemical experimental bench, I made an inexpensive one from a rubber connector used to attach a hose to a sink faucet. Such connectors can be obtained at any ten-cent store. The only alteration necessary is to

tube as shown in the drawing. When this aspirator is connected to a faucet, and a good head of water passes through it, a vacuum is created, which is useful in accelerating filtration. If the connector is to be used for other purposes, the glass tube can be removed and a glass plug put into the hole.—George J. Vias, Chicago.

Garment Hanger Used as Form for Infants' Sweaters

To keep an infant's sweater from shrinking out of shape while it dries after laundering, use this wire form, which is bent from a garment hanger. Then you can hang up the sweater so that it will dry faster than when it is laid out flat on a table.



Belt Lacing Used as Ice Creepers

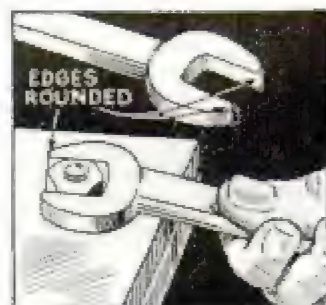


During some bad weather, which left roads and walks coated with ice, a Wisconsin hardware dealer made a quantity of ice creepers from steel belt lacing and skate straps. The

lacing was riveted to the straps and the creepers were strapped under the instep of the shoe as shown.

Wrenches with Rounded Noses Slip over Nuts Easily

A set of end wrenches can be improved by rounding the ends as indicated. This makes it easy to slip the wrench over the nut, especially if it should be hard to reach.



Handwritten note: *Suggest Perry Machine Co 716 2nd St St*



Say it with CHRISTMAS CARDS

BLOCK PRINTS - CUTOUTS - ENVELOPES, -- NOVELTY AND PHOTOGRAPHIC CARDS

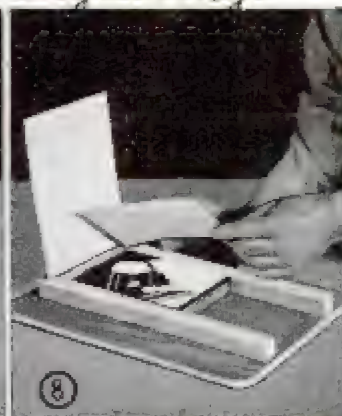
made at home



Linoleum "engravings"

IT'S fun making your own Christmas cards, and the result is emphatically "greetings by you"—not a cold substitute purchased over the counter. Artistic ability is required for some of these cards; others demand no more skill than the ability to paste two pieces of paper together.

Let's start with linoleum block prints. The manner of making these has been told often so we will confine our remarks to a few of the high lights of the process. The printing plate is a suitable





square of battleship linoleum, and on this is tooled the image of the picture which is to ornament the card. Tools for this purpose, together with a little booklet on how to do it, can be purchased from any stationer for about one dollar. After the plate has been made, it is inked with printers' ink, as shown in Fig. 1. The block is then placed in a book press, the paper is laid over it, and the clamp is turned down tightly to make the impression. Lacking a

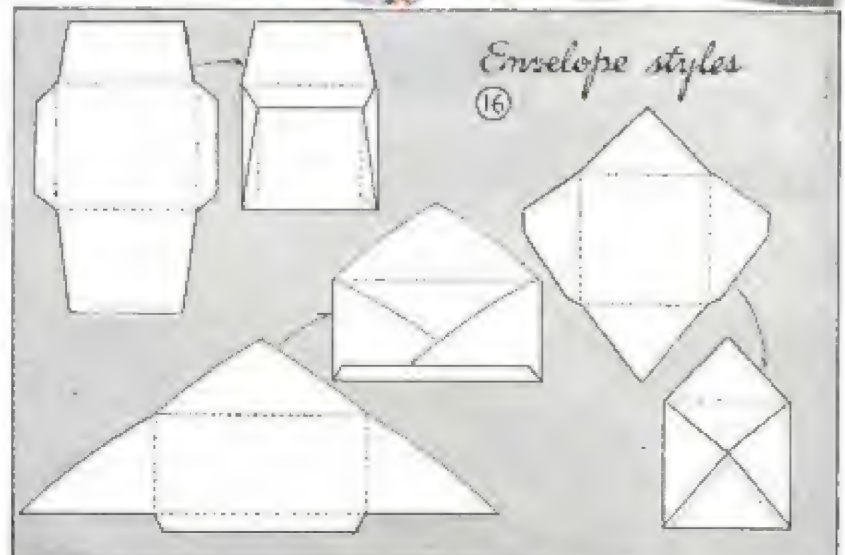
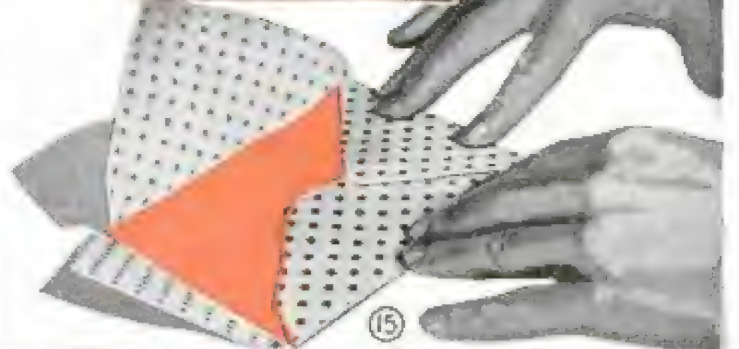
book press, you can get nice impressions with the simple press detailed in Figs. 7 and 8. The side pieces hold the plate in position and are about $\frac{1}{4}$ in. below the level of the plate. The flap is a piece of felt, sheet rubber or cardboard. The impression is made by turning the flap down and rubbing with a rolling pin, as in Fig. 7. Typical examples of block printing are shown in Figs. 2 to 6.

With a scroll saw, you can work wonders with paper cutouts, as illustrated in Figs. 9 to 11 inclusive. A suitable design is first drawn on paper which is cemented to a $\frac{1}{8}$ -in. piece of wood. A similar piece is used on the bottom of the "pad" with 30 to 50 sheets of paper between the two. See Fig. 10. The design is then cut on a scroll saw, resulting in a complete set of paper cutouts. Three applications of this cutout are shown in Fig. 9. One is a glazed black card with a short fold, the cutout being tipped on the short fold. Another shows a single fold of cream-colored paper, on which is tipped a square of red metallic paper on which is tipped the cutout. The third is a cutout in reverse. That is, the cutout in this case is the portion discarded in the other examples. The cutout is of silver paper and it is tipped on a black card. The lettering is "spatter work," applied by using a stencil and then spattering the color on with a toothbrush, as shown in Fig. 11. In Figs. 12 to 14, the Christmas tree, the moon, and the word "Noel" are cut out on the scroll saw. The edge of the tree is outlined with white and the tree cutout is backed with green metallic paper, while the moon and "Noel" are backed with red metallic paper.



Now we will consider something else: Envelopes . . . and paper. Ordinary stationery in tint colors often can be adapted for greeting-card use, and in this case you would have paper and envelopes to match. However, it's no trick to make your own envelopes, and by using decorative papers you can add a lot to the smartness of the card. Fig. 16 shows various envelope styles. A cardboard pattern should be made so that the outline can be transferred quickly to the paper and cut out. Envelopes should be $\frac{1}{8}$ in. larger than cards. Folding is done over a square of cardboard, as shown in Fig. 15. The edges can be cemented, or Christmas seals can be used for this purpose. The paper for cards can be almost anything. Colored Bristol board is excellent and easily obtainable. Construction paper (the kind that children use in school work) is sold almost everywhere and can be obtained in all the colors of the rainbow. Its one fault is that it has a full soft finish. This can be remedied in many cases by using jackets of Cellophane. Decorative paper for cards and envelopes can be obtained from most stationers; also it can be obtained in 24-sheet packages at the dime store during the Christmas season. For other kinds of paper, see your local printer. He has sample books of numerous papers and will be glad to order for you.

If you like to emboss cards you can use the simple home-made press shown in Figs. 21 and 22. The dies are made of wood and cardboard, and should be registered accurate-







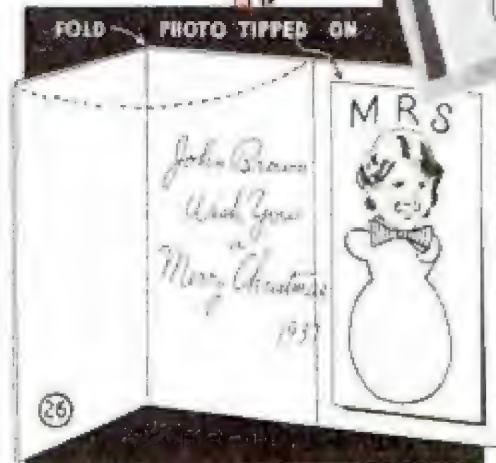
and
Photos



a clean pen to write with, and apply medium pressure in writing. Join all the necessary letters together, and do not completely loop closed letters such as "o, s, y," etc. The paper used should be thin tracing paper. Some heavier papers will burn if the letters are gone over twice.

Figs. 23 to 26 are examples of easily made photographic cards. The one in Fig. 24 is made from five snapshots, one of which is shown in Fig. 23. These snaps are cut out and mounted on a piece of white cardboard. Rephotographing gives the finished negative from which the cards are made. All lettering is done on the pasted-up layout before copying. The photo heads of Fig.

25 are cut out and pasted up, after which the sketches of the snow men and the lettering are worked with black ink. The result is then copied and as many prints as may be necessary are run off. Fig. 26 shows the inside of this card, the greeting being hand-written. A neater method is to have the greeting printed on small slips of colored paper, tipping these in on the card.



And so, there are endless varieties of photographic cards that can be made. Pictures of members of the family, of the home, either inside or out, make such cards personal. You can use silhouette snapshots, fireplace scenes, with original pen-and-ink sketches and lettering added, depending entirely on your fancy.

There's still another interesting possibility in making attractive Christmas cards on ordinary blueprint paper. The paper costs very little and the only other expense is that of a few photo negatives. The result of this type of work is shown in Figs. 27 to 31 inclusive. In this particular

Blueprinted greetings



instance 7 by 9-in. sheets were used, the dotted lines in Fig. 29 indicating where the sheets were folded. The front of the card is displayed in Fig. 27 and the inside pages in Fig. 28. All lettering and photos show up in blue on a white background. A soft photo can also form the background over which a suitable verse appears, Fig. 29.

In preparing these prints you proceed as follows: Get a roll of blueprint paper to provide as many sheets as you desire. It is cut with a fingernail file to obtain a torn-edge effect. This must be done in a sub-

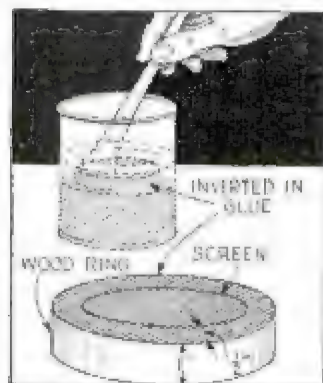


dued light or the paper will be given a bluish tint. Then the paper is stored in a box until you are ready to print. Next, select negatives that will reproduce well in blue and white. You can letter the words "Season's Greetings," or something else, on the one that will be the front. Also get a negative of a verse or greeting which you desire for the inside. Cement the negatives to the glass of a printing frame, which is slightly larger than the size of the unfolded sheets. For a 7 by 9-in. unfolded card, use a 10 by 12-in. printing frame. Cement the negatives with their glossy side next to the glass, as in Fig. 30, using colorless fingernail polish or collodion at their edges. Then cut a mask from black, opaque paper as in Fig. 31, to fit over the photos and snugly inside of the printing frame. All masked parts remain white on the finished card. It is a simple matter to mount the sheets of blueprint paper in the printing frame, sensitized side facing the mask. This is done in a subdued light. Then exposure is made in the direct sunlight. After the correct timing has been determined, perhaps 10 min., you can expose as many sheets as desired, one by one, and they will all be uniform.

If you want a very light photo showing behind the lettering, you use a separate printing frame for this negative, which is cemented in place and masked, as already explained, taking care that this photo will come in register with the printed matter. Then after the first printing has been done, the sheets are put into the second frame and subjected to an exposure that will give the desired density behind the printed matter—perhaps one-third the exposure of the first printing. The prints are developed

by washing them in lukewarm water for about 2 min. Then they are put in clean, cold water for 5 min. After washing, the prints are spread out on newspapers to dry. The final step is trimming and folding. With this process the total cost of 150 cards and envelopes was only \$3.05.

Float in Gluepot Keeps Brush from Getting Messy

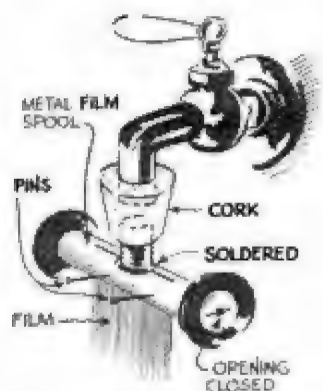


When using glue, cement, mucilage and similar adhesives, this float in the container will support the brush and keep the handle from getting smeared with the sticky liquid. Made of balsa wood, the float is

merely a ring covered on the underside with a disk of screen wire. In use, the weight of the brush submerges the float enough to keep the bristles moistened.

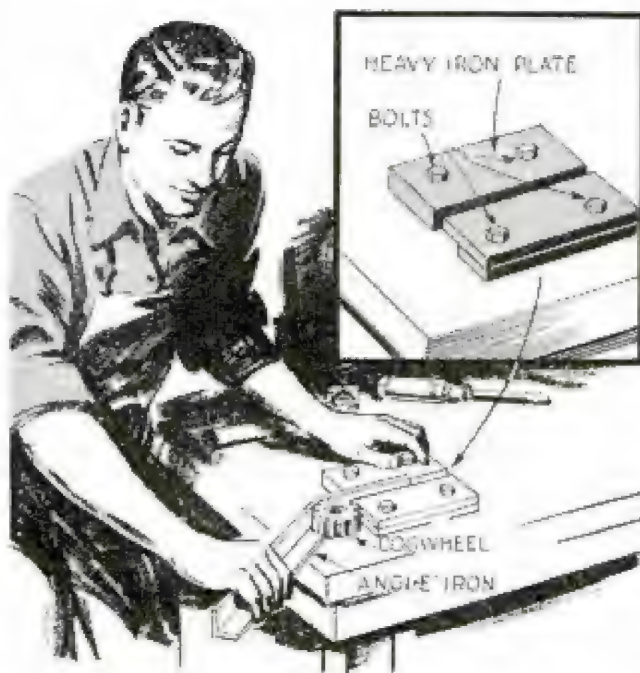
Negative Washer from Film Spool

Utilizing the metal spool from a roll of used film, one photographer improvised a negative washer to which his roll film could be attached after development. All openings in the spool are soldered up except the long film slot in the lower side. A short length of metal tubing is then soldered over a hole drilled in the top of the spool, to which the washer can be coupled directly to the faucet with a cork when washing cut



film, or to which rubber tubing can be fitted to suspend the film so that water will flow over its entire length. The film is attached to the spool with pins, which pierce the corners as it is inserted part way in the slotted opening. As a spray of water is maintained on both sides of the film, it can be washed in a few minutes.

Jig to Bend Light Angle Iron Quickly Improvised



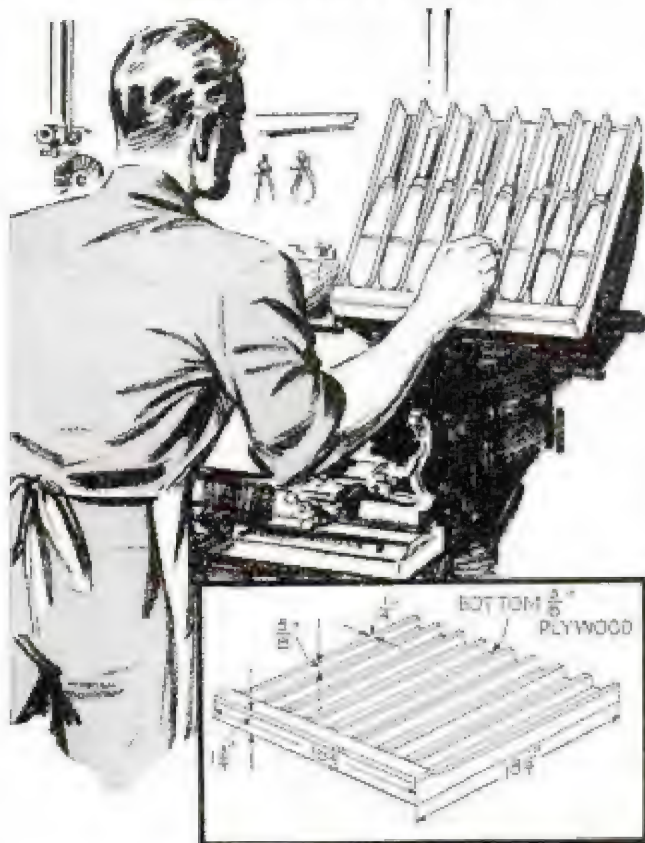
You'll be surprised how neatly you can bend light angle iron if it is heated and then bent on this jig

The home workshop owner who occasionally has a small job of bending light angle iron will find this jig helpful. It consists of three blocks of iron, one of which has a thickness equal to the combined thickness of the other two. These are bolted to the bench top as indicated in the detail. The narrow strip of iron on the bottom on the side where the two pieces are used should not be much thicker than the angle iron to be bent. The cogwheel is bolted to the bench in front of the iron blocks as indicated. In use the iron is heated, after which it is inserted between the iron blocks and then bent around the cogwheel. Bends of different sizes can be made by using different cogwheels.

Wax to Prevent Bleeding of Trees After Pruning Them

When pruning trees and shrubs, the following mixture makes a good wax to keep them from bleeding. To make the wax, melt pure coal tar, 1 lb., and add rosin, 4 oz. While the mixture is cooling, add coal oil to make a thin paste, and when cold, stir in lead arsenate, 4 oz. The paste should be applied to the wounds with a brush and should overlap the sides of the branches at least $\frac{1}{4}$ inch.

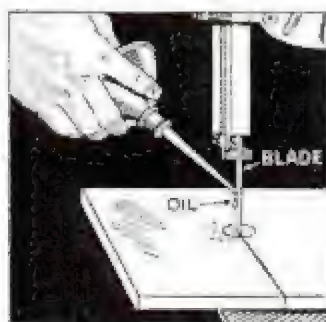
Rack to Hold Lathe Turning Tools Supported on Wall



This rack keeps your turning chisels within easy reach, yet out of dust and wood shavings

You can make this rack in a short time, and it will keep your turning tools conveniently at hand above the lathe, yet far enough to one side to avoid shavings and wood dust. If each tool is always kept in the same compartment, you will, after a little practice, become so accustomed to their position that you can reach for the tool wanted without looking at the rack.

Resin Kept Off Band-Saw Blade by Oil Coating



On a job of cutting out a number of articles from resinous wood on a band saw, it was found that the wood gum could be prevented from adhering to the saw blade, which caused it to bind in the guides, by coating it with oil occasionally. As oil tends to rot the rubber lining of the band wheels, they

should be cleaned thoroughly of all traces of oil after the job is finished.

—Dale R. Van Horn, Lincoln, Nebr.

Photo Solutions Protected by Glass Marbles

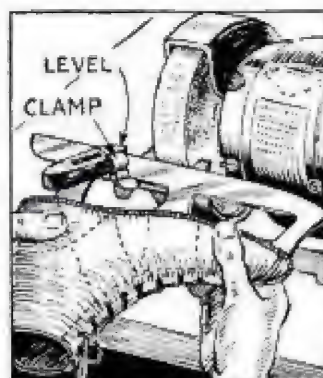
As it is necessary to keep bottles of photo-developing solutions full to the stopper in order to exclude all air, the problem of replacing the solution as some of it is wasted in use is solved by glass marbles. These should be perfectly clean and are dropped into the bottle as required to keep the solution well up in the neck near the stopper at all times.

—Robert J. Williams, Chicago.



Level Clamped to Ice Skates Aids in Sharpening

After experiencing some difficulty in holding my skates correctly against a grinding wheel to sharpen them, I solved the problem by using a small level as shown. This was attached to a small spring clamp which was slipped over the skate blade to indicate when the blade was held horizontally against the abrasive wheel.



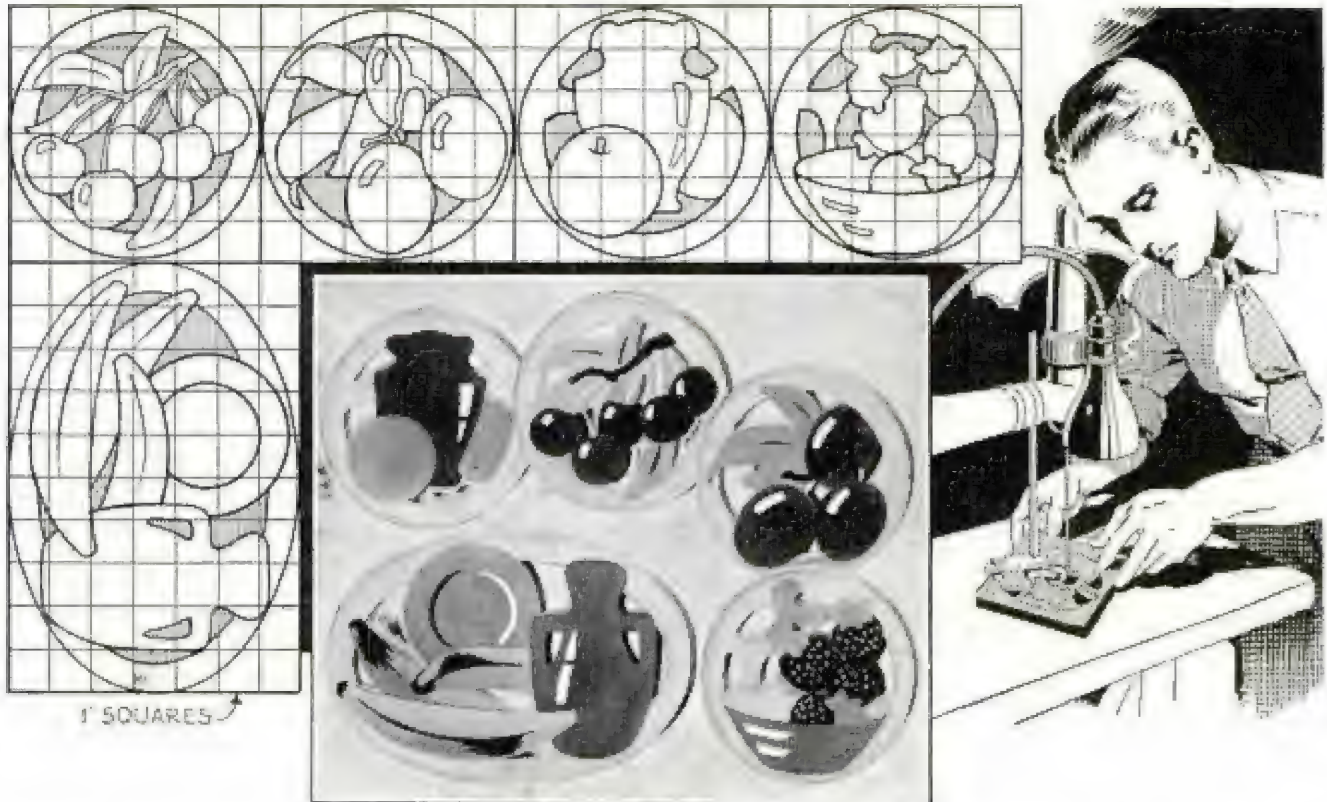
tally against the abrasive wheel.

—Duane U. Norgren, Bremerton, Wash.

Rubber-Head Tacks in Rack Keep Towels from Falling

If you have trouble in keeping towels and wash cloths from slipping off the wood arms of a folding-type rack, drive three or four rubber-head tacks in the top surface of each arm. Friction between rubber and cloth will keep the towels from slipping.

Decorative Hot-Dish Mats Sawed from Wood



Simulating dishes of fruits, berries and even a serving tray with fruits, dish and water pitcher, these hot mats not only protect your table but they offer a decorative effect. If the designs are enlarged on paper marked off in $\frac{5}{8}$ or $\frac{3}{4}$ -in. squares instead

of 1-in. squares as suggested, they will be suitable for coasters. The mats are sawed from $\frac{1}{2}$ -in. stock, and the coasters are cut from $\frac{1}{4}$ -in. stock, which is then sanded and decorated as desired.

—H. F. Showalter, Davenport, Nebr.

Study Cabinet on Table Holds Books and Writing Paper

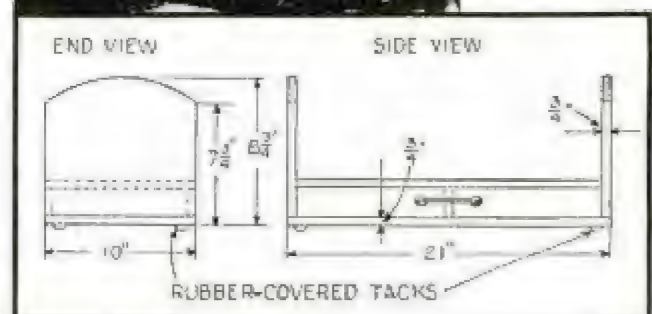
This small cabinet is just the thing for the student to keep his study materials neatly at hand. The two sides support books like bookends, and a drawer at the bottom provides a place for pencils, pens and paper. The simplest finish is to stain and wax. Rubber-head tacks on the underside will prevent scratching the table on which the cabinet is set.

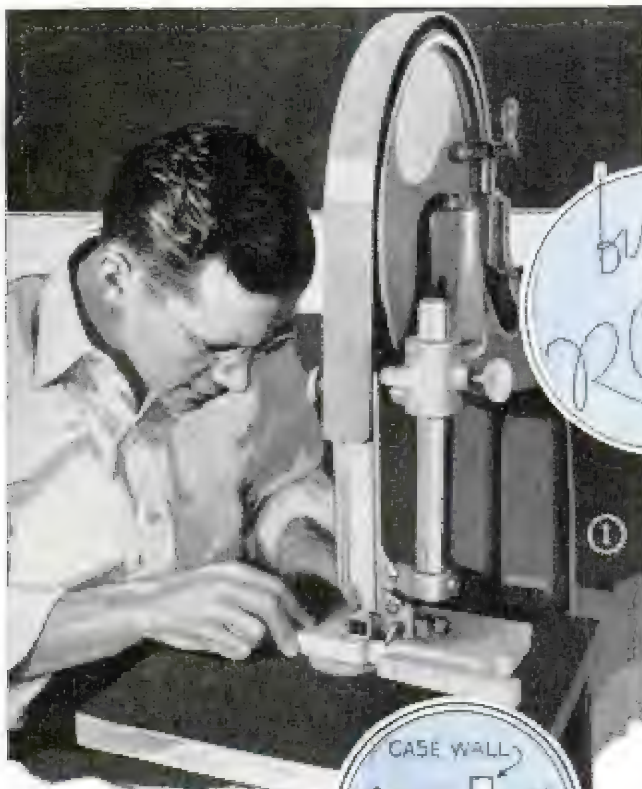


Whitewashing Basement Walls

Here's a whitewash for masonry walls that I have found highly satisfactory. It is as easily applied as paint and does not flake off. To make it, mix dry, hydrated lime, one-half pail, common salt, 2 handfuls, a dime's worth of alum, and powdered glue, $\frac{1}{2}$ lb. When ready to use, mix with boiling water to the consistency of paint.

—Chet Shafer, Three Rivers, Mich.



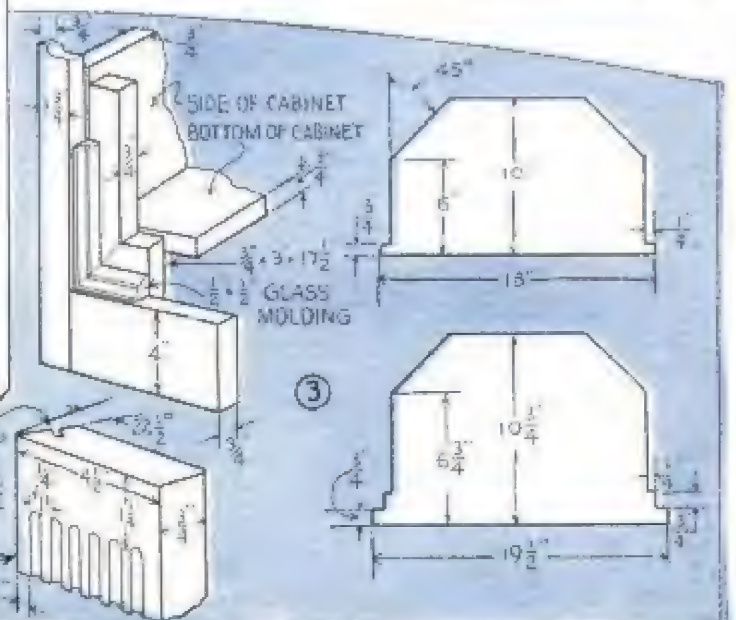
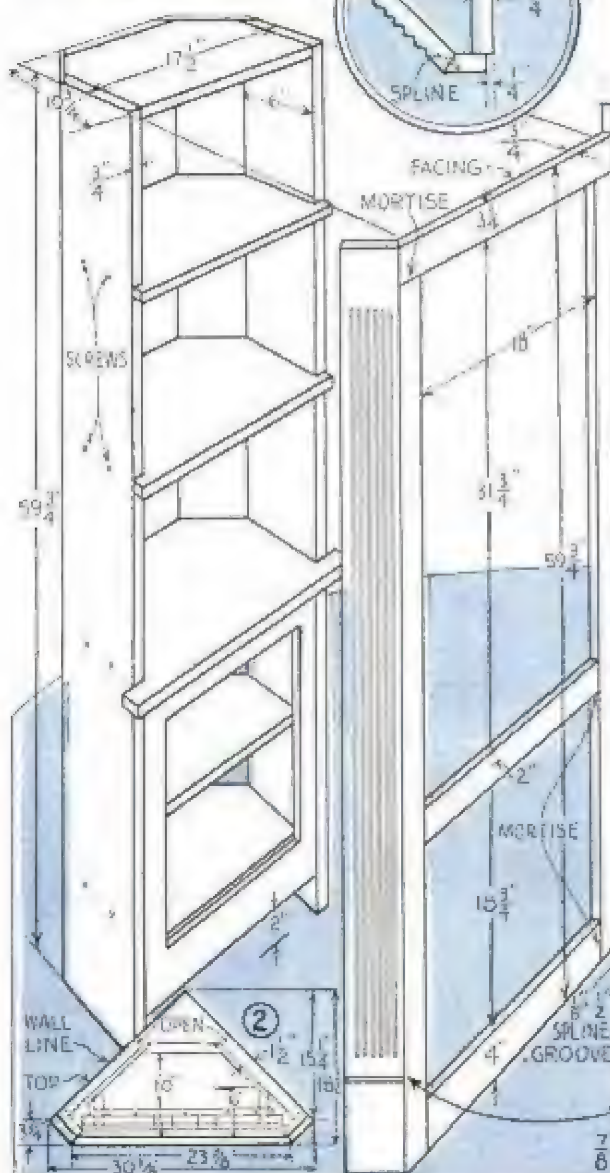


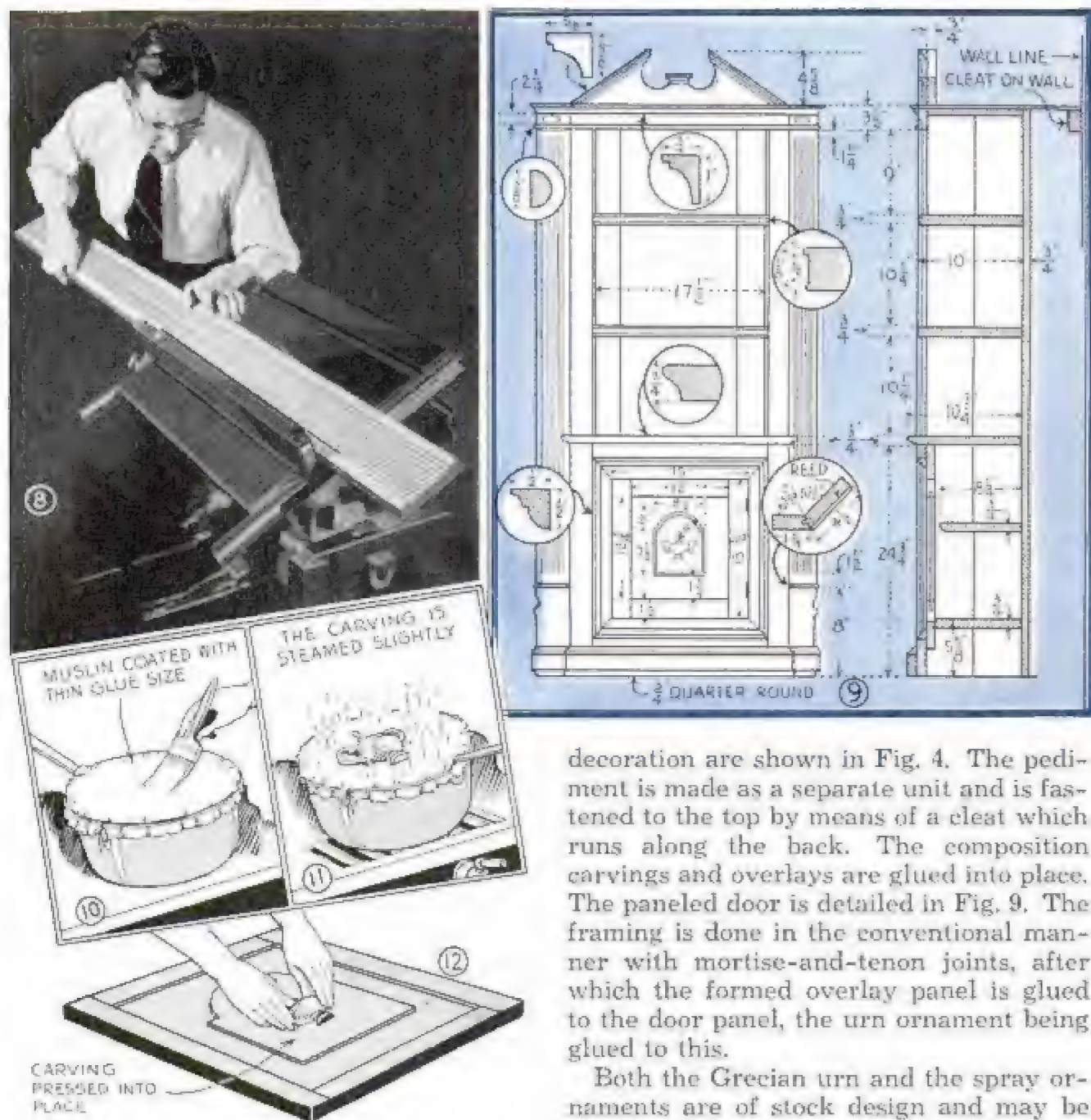
BOOK-

-- built in

AN EXAMPLE of the classic type of furniture which will always find a place in your home, these corner bookshelves can be made of almost any easily worked wood, such as white pine, or even a combination of woods as they may be finished in stippled ivory enamel. Figs. 2 and 9 give the general dimensions of the piece. Note in the lower left-hand detail of Fig. 2 that the carcass of the cabinet is kept $1\frac{1}{2}$ in. away from the wall, at the sides, to clear the baseboard. The top, however, is sealed in to prevent the entrance of dust, the top piece being supported with cleats fastened to the wall. Nailing the top to the cleats and to the case also prevents the latter from tipping.

Construction of the carcass and its relation to the facing are given in Fig. 2. The side and back pieces are assembled around the shelves and screwed to them. Details of the shelves in Fig. 3 give their size and shape. The compartment at the bottom has a mitered frame around it to form a set-back for the paneled door. The detail in Fig. 3 shows how the various pieces are assembled. Glue, hidden screws and brads





the baseboards of the room. This not only makes it convenient to do an accurate job of fitting, but also makes it possible to move the case to a new home, where, owing to a difference in the baseboard, new panels may be required. Fig. 6 shows a detail of the base and the removable block, together with the method of fastening it in place. The contour of the baseboard can be copied by fitting a piece of wire solder or soft copper wire around the piece, then carefully removing and marking on a piece of cardboard. The contour is then cut out for a true fit, before using it as a pattern. Fig. 1 shows how the cut is made on a band saw.

Details of the pediment, molding and

decoration are shown in Fig. 4. The pediment is made as a separate unit and is fastened to the top by means of a cleat which runs along the back. The composition carvings and overlays are glued into place. The paneled door is detailed in Fig. 9. The framing is done in the conventional manner with mortise-and-tenon joints, after which the formed overlay panel is glued to the door panel, the urn ornament being glued to this.

Both the Grecian urn and the spray ornaments are of stock design and may be purchased for a few cents, yet their use gives a professional touch to the whole assembly that would be hard to obtain in any other way. The method of applying composition ornaments is shown in Figs. 10, 11 and 12. The carving must be steamed slightly so that it becomes somewhat pliable and thus can be pressed down in perfect contact with the surface to which it is applied. These ornaments are frequently curled somewhat when received but are readily flattened out after the steaming. Applying the glue by the method suggested causes it to penetrate the porous backing of the ornament and form a tacky surface that adheres well. No additional glue should be applied as it tends to ooze out around the lines of the carving where

it is difficult to remove. To assure getting the ornaments placed properly it is suggested that they be laid in the desired position before steaming and their outline traced with a sharp pencil. Placing a board and weight over the ornament after it has been glued, is also advisable.

Finishing of the cabinet, after it has been well sanded, is accomplished by applying two coats of enamel undercoat which has been slightly tinted with chrome yellow. The undercoats should be sanded lightly, between coats, to secure a smooth surface. The finishing coat of ivory enamel should be of the semi-gloss variety. As soon as the entire surface has been covered and the enamel has started to set, it should be gone over with a stippling brush or some brush that has short, stiff bristles, to break up the film of enamel into a pebbled effect. A pleasing antique effect may be had by working a little burnt umber, in oil, over the dry enamel. The color should be thinned with benzine. A cloth pad is used to apply the color which should be wiped off immediately after applying, wiping only over the surface and permitting the color to remain in the depressions. The trick in doing this successfully is to get the desired effect the first time over the surface, as a second application is apt to build up the color into solid tones.

Life of Christmas-Tree Lights Increased by Extra Bulb



extra lamp reduces passage of current through the circuit, it does not noticeably reduce the brilliance of the lights. Spare sockets may be purchased with wires attached for the purpose.

—C. E. Packer, Chicago.

☐ You'll be surprised how easily dry bread crumbs can be removed from a toaster by using a small paintbrush.

Long Weatherboarding Put Up with Aid of Wood Clip

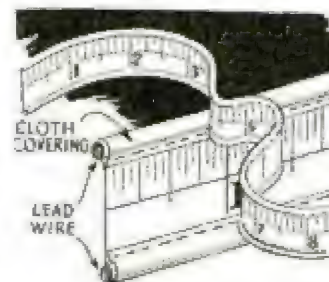


Two wood clamps slipped over long piece of weatherboarding hold it in place while nailing

By using a couple of these clips, the job of nailing up long pieces of weatherboarding single-handed is simplified. The clips are cut to the shape indicated, from hardwood or tough soft wood, nails being driven through the closed end to strengthen it against splitting. In use, a piece of weatherboarding is laid up in place and the clips are slipped over it, as indicated, to hold it in place while the lone workman nails it.

Tape Measure Has Lead Edges for Irregular Surfaces

One workman who had to measure long, irregular surfaces solved the problem of getting the tape measure into the depressions by sewing lengths of wire solder to the edges of it. The solder permitted the tape measure to be shaped to the contour of the work to get the entire surface measurement.



Also, the tape measure is a handy aid in duplicating irregular surfaces as it will keep any shape if handled carefully.

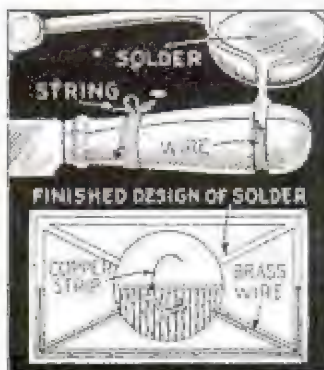
This Portable Clothesline Reel Is Easy to Handle



Use this reel and you can put up or take down your clothesline without tangling it or getting it dirty

Portable and light, this reel enables you to put up or take down your clothesline without getting it dirty or tangled, as the line does not touch the ground or have to be handled, and can be hung on a wall in the basement, pantry or washhouse. Hardwood is best for the reel, and it should be given a couple of coats of paint to protect the wood against dampness.

Repairing Broken Knife Handles



To repair split wooden handles on knives and small tools, place the broken pieces in the correct position on the tool and tie them together. Then cut grooves around the handle and wrap soft brass or copper wire tightly in the bottom of the groove, twisting the ends together. Using the wire as a solder base, run the groove

full to make a complete band, and then file the solder flush with the wood. Flat wood surfaces can be artistically inlaid with solder in the same way. The design is first grooved or cut in the wood, after which soft brass wire is laid in the grooves, using small brass tacks or brads to hold the wire in place. Then the melted solder is dropped into the groove.—C. J. Hotz, Lincoln, Nebr.

Scale on Knitter's Handbag

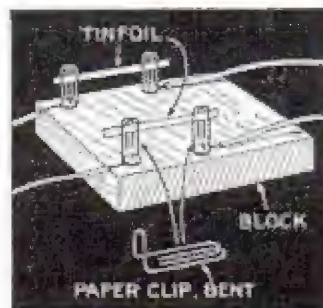
Women who carry a crocheting or knitting bag will find that a scale marked on one of the handles is quite convenient and always at hand for measuring the work. The scale can be a 12-in. length of tape measure glued to the handle, or a scale can be scribed right on the wood. This can be done with



a sharp-pointed instrument, after which some paint is applied, this being wiped off the surface of the handle so that it only remains in the depressions.

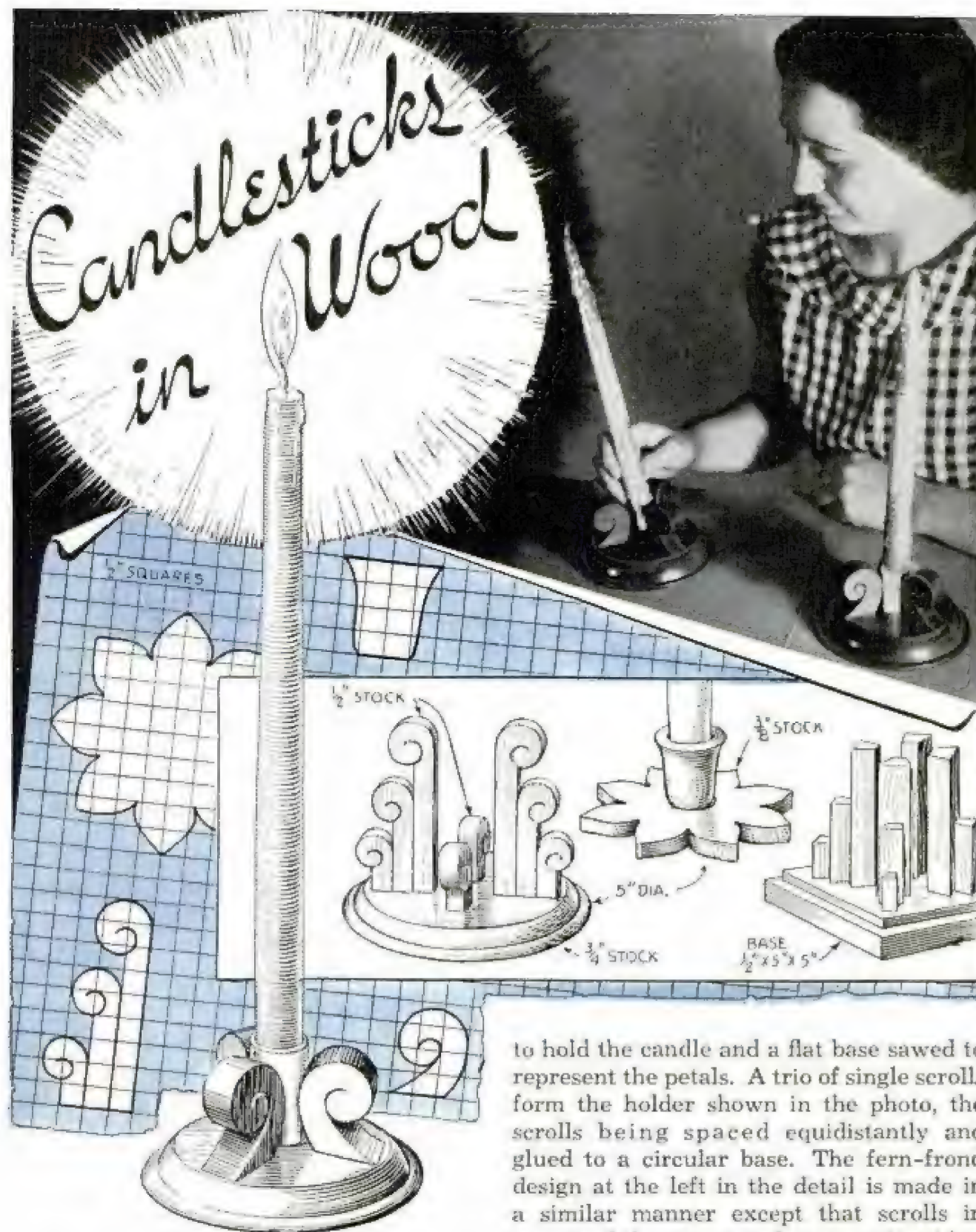
Fuse Block for Experimenters

When experimenting with electrical devices of unknown voltage or wattage, this improvised fuse block will save fuses in the house wiring. Using narrow strips of tinfoil of varying widths as fuses, the block sets on the bench near at hand, and consists of a piece of wood with four wire paper clips fastened to it with thumbtacks as indicated. The block is installed in the electrical circuit between the wall outlet and the bench.



—A. H. Waychoff, Tempe, Ariz.

☛ Clean powder puffs are handy for cleaning silverware; use one to apply the polish and one to do the buffing.

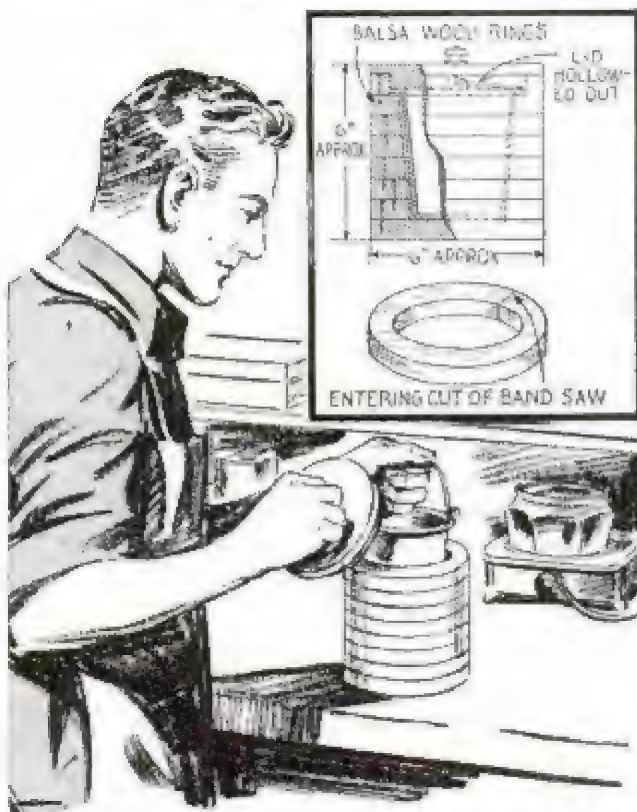


Unusual in design but simple in construction, these wooden candlesticks suggest flower, plant and architectural forms. Scrolls and simulated fern fronds are used in groups of three or four as graceful supports for candles, and blocks of graduated sizes make interesting designs arranged on square bases. The jonquil holder shown in the center of the detail has a turned cup

to hold the candle and a flat base sawed to represent the petals. A trio of single scrolls form the holder shown in the photo, the scrolls being spaced equidistantly and glued to a circular base. The fern-frond design at the left in the detail is made in a similar manner except that scrolls in groups of three are used on opposite sides. The geometric holder at the right of the detail is composed of four supports made up of three sizes of blocks, which are glued together and slightly rounded at the back to fit the candle. They are mounted on a square double base in diamond pattern.

Use a fly spray or an old atomizer to distribute polish on a dust cloth evenly.

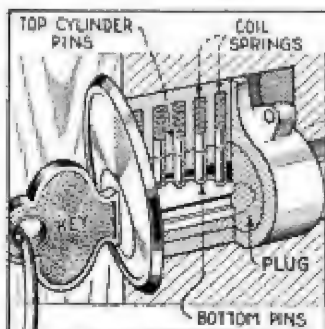
Gluepot Is Kept Warm in "Cozy" for Several Hours



You can make this "cozy" in an hour and it will keep your gluepot warm without fuel consumption

Instead of keeping your gluepot warm over a gas or electric plate, try this "cozy," which will keep the glue liquid for several hours without fuel consumption. It is assembled from rings cut from pithy balsa wood, the rings being progressively narrower toward the top as they are stacked and nailed together. The lid and bottom are also balsa. In use, the glue is heated in the regular way, after which the inner part of the pot is removed, wiped dry, placed into the cozy and the lid put in place.

Repairing Worn Cylinder Locks



If you have a cylinder lock that refuses to work after being in use for some time, the trouble is probably caused by worn tumbler pins, which can be renewed quite easily.

As shown in the drawing, this type of lock has two sets of pins of varying lengths, one set in the cylinder and the other in

the upper part of the lock, the latter set being under pressure of small coil springs. When the cylinder is turned to the locked position and the key removed, the lower pins drop down, allowing the upper pins to enter the pin holes in the cylinder to keep it from turning. When the key is inserted, however, the lower pins are raised so that their upper ends are flush with the cylinder, forming a broken line between the two sets of pins so that the cylinder can be turned. Thus, a little wear on the ends of any lower pin will allow the upper pin to engage the cylinder. The only repair is to put in a new pin in place of the worn one, insert the key and file the upper end of the pin flush with the cylinder.

Soap Lubricates Knife Blade to Cut Rubber

When cutting a block of rubber into smaller pieces, or when cutting heavy sheet rubber, lubricate the edge of the knife with a soap paste and the job can be done easily. The paste is made by slicing laundry soap into water and boiling it until the mixture is of a creamy consistency.

—A. H. Waychoff, Tempe, Ariz.



Holder Keeps Glass Stopper on Bottle Neck

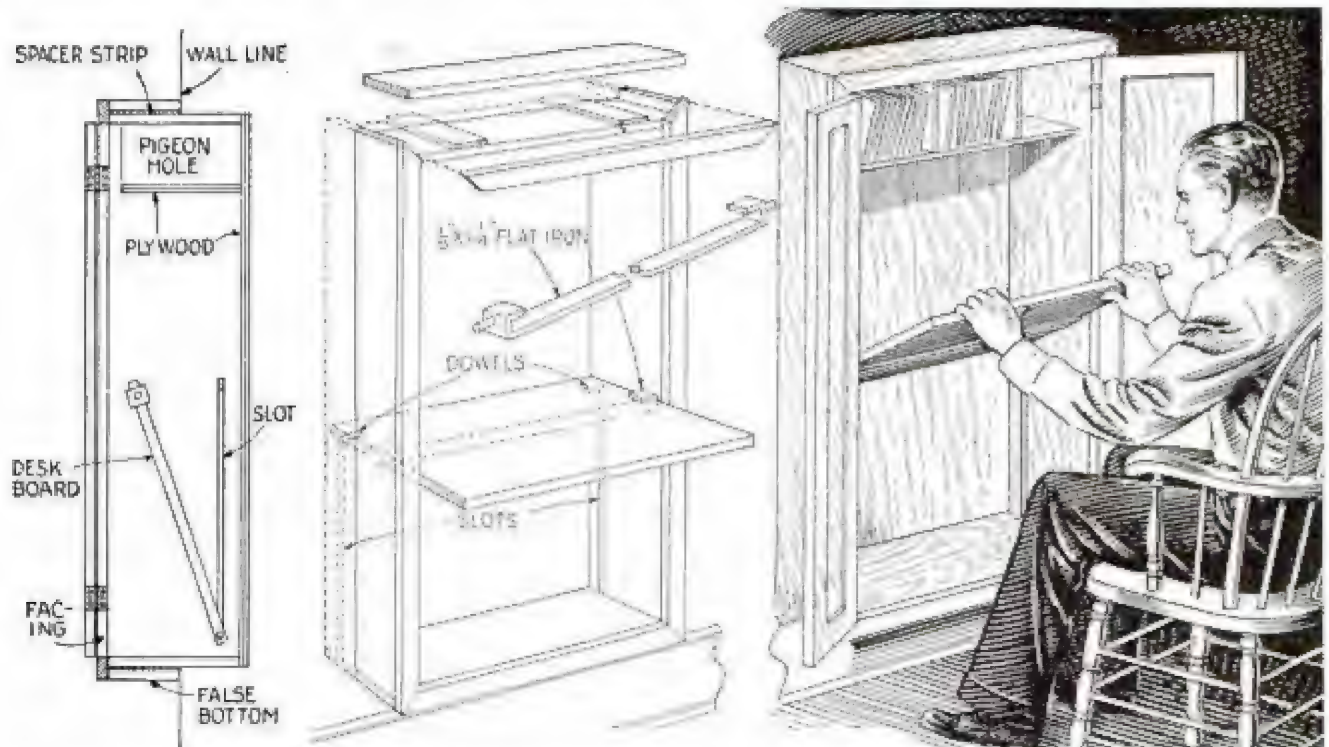


It is better not to lay a glass stopper on the table after removing it from a bottle, but instead, to make a rubber holder to keep it right on the bottle. Such holders can be cut

from inner tubes by merely cutting off strips of the right length and width, after which holes slightly smaller than the mouth of the bottle and the neck of the stopper are cut in the ends.

Burl Knutson, Bismarck, N. Dak.

Foldaway Cabinet Serves as Writing Desk



Built into a wall, this cabinet is neat and takes very little space in a room, yet it has ample room for storing stationery, and a large tilting shelf, which serves either as a writing or typewriter desk. The shelf rests on a flat-iron support, the ends of which are pivoted to the sides of the desk as shown. Short dowels in the ends of the shelf near the rear slide in vertical slots cut in the sides of the cabinet. This ar-

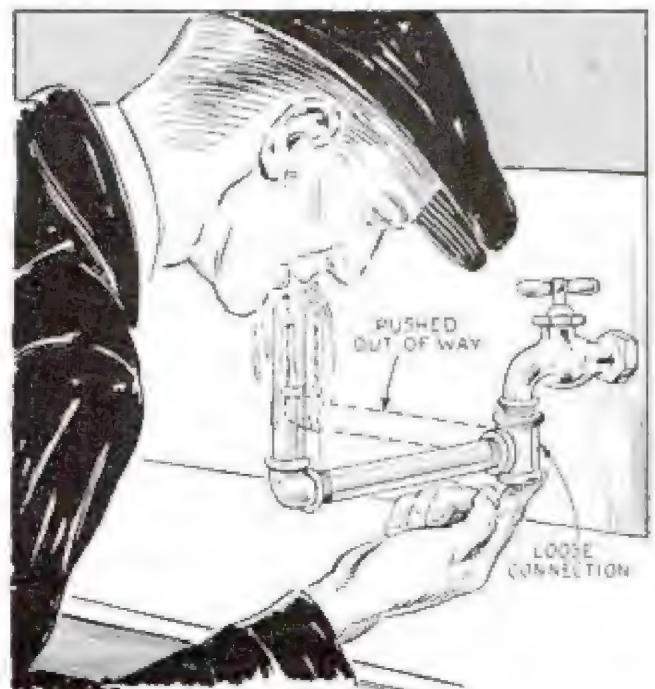
Tilting shelf should be about 26 in. from floor if used for typewriter desk, or 30 in. when used only for writing

angement permits the shelf to be folded away by lifting up the outer edge and letting the rear edge drop down, guided by the vertical slots.

—John E. Hyler, Peoria, Ill.

Drinking Fountain on Sink Faucet Assembled from Pipe

This simple pipe assembly will provide a sanitary drinking fountain to replace the cup or glass at the workshop sink. The fountain is attached to the faucet with a loose tee, which permits the assembly to be swung back out of the way when not in use. When using, merely hold the thumb or finger over the bottom of the tee which is left open to run water into the sink when desired.

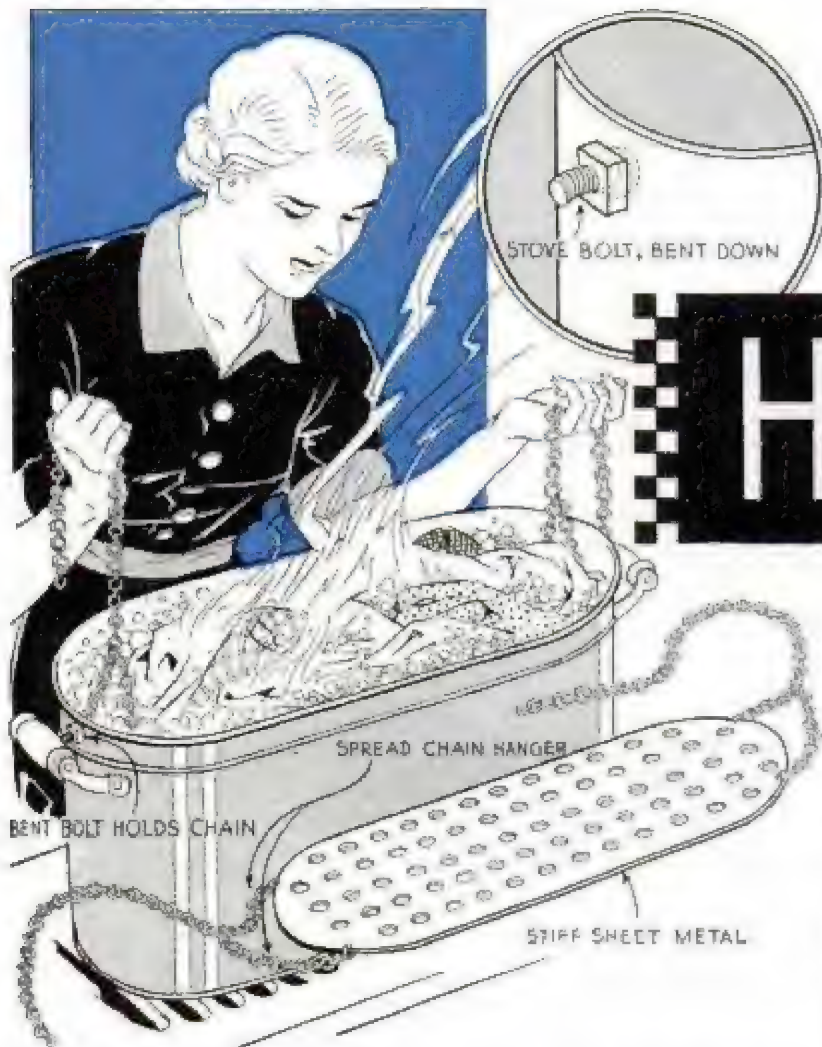


Taking the "Stick" Out of Doors

When a door sticks at the top, remember that there are two surfaces involved. Before planing the upper edge of the door, hold a block of wood against the frame and tap it firmly upward. This will usually raise the casing slightly.

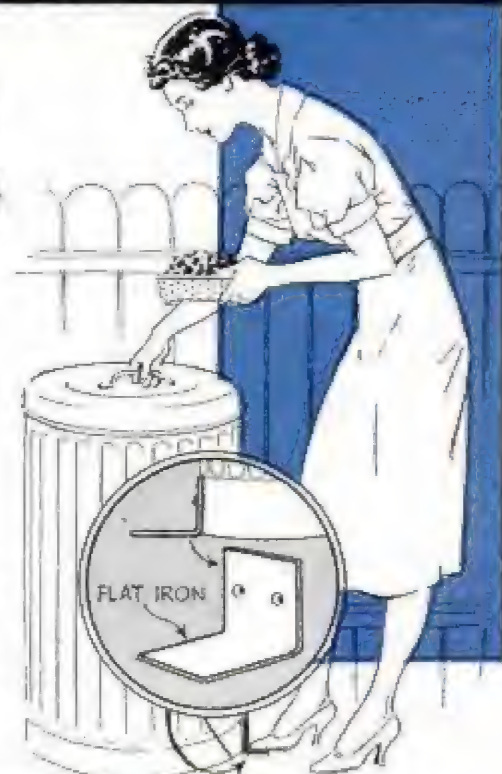
EASY for

HOME

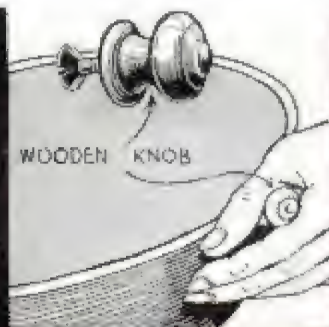


Retrieving small garments from the bottom of the wash boiler is a simple matter if you use a perforated false bottom as shown above. Just pull up on the chains, hook them over the projecting ends of the bolts and there you are

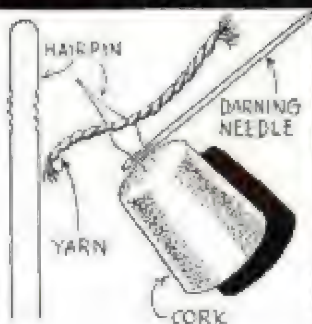
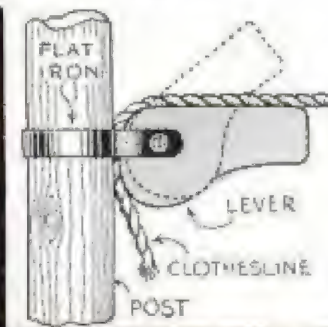
Snug-fitting lids on garbage cans are removed easily with one hand when this flat-iron bracket is riveted at the bottom of the can so that the foot can be used to hold it down



It's not hard to thread a needle with yarn if you use a fine-wire hairpin bent to the shape shown below and inserted into a cork to pull the yarn through the needle eye



Stretched around the edges of a scrubbing or scouring brush and tacked to the ends, a wide rubber band, cut from an inner tube, provides a dandy shield to protect the fingers

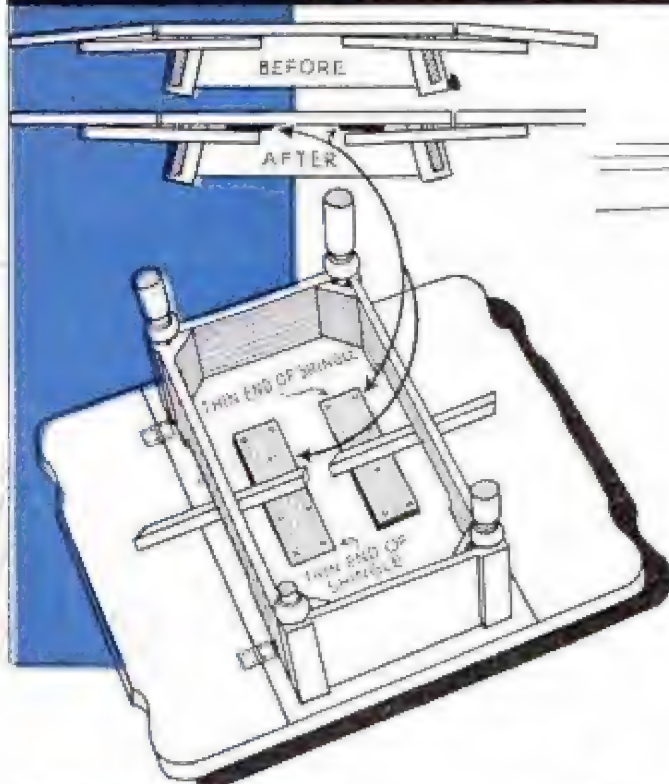


A wooden mixing or chopping bowl is easy to handle and turn about if a wooden knob is screwed to the outside surface near the top. The screw head should be countersunk



With this eccentric fastener, you can stretch your clothesline and hold it as taut as desired. And, there are no hard knots that have to be untied when you take down the line

SOLUTIONS *Your* PROBLEMS



Concealed behind a door on folding brackets, this ladder pulls out to provide access to the attic in a one-story house where there is no stairway

Sagging leaves on the table at the left were repaired by screwing strips of wood shingles to the underside of the top to contact the swinging leaf supports and raise them at the outer end

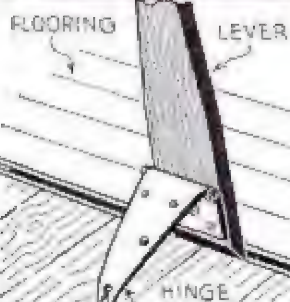
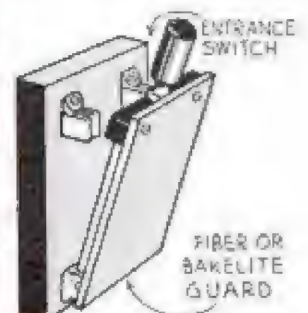


Here is a strong device for forcing warped flooring together for nailing. It consists of a board pry bar to which is screwed a strap or T-hinge with claws cut in one end

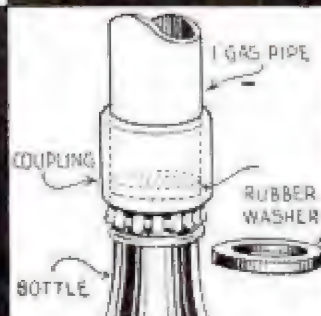
FOUNTAIN PEN



For occasional capping of bottles, this emergency capper is quickly made. It consists of a short length of pipe with a coupling on one end, inside of which is a rubber washer



By replacing the pen point of a discarded fountain pen with a round piece of sponge rubber, you have a handy pocket device to carry for moistening stamps, envelopes and labels



Screwed to the front of an unshielded knife switch, a piece of fiber or Bakelite will prevent anyone from accidentally touching the bare parts which might give them a shock

Looking on Top of High Shelves with Aid of Mirror



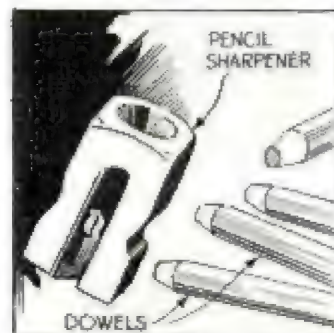
Use a mirror on a handle like this one to look on high shelves instead of climbing on a chair

If you have high shelves in a closet, pantry or storeroom, here's a good method of looking on them without climbing on a chair or ladder. Get a small pole, such as a broomstick or piece of bamboo, and bolt a piece of thin flat iron bent to a U-shape on one end to take the handle of a hand mirror. Then, when you want to look on top of the shelves, hold the mirror above them as indicated.

Small Dowels Pointed Quickly

Modelmakers and others who work on small projects with wood will find a common 5-cent pencil sharpener useful for pointing or chamfering the ends of small dowels and square

sticks. The sharpener will last a long time, and can be bought at any ten-cent store.



BUILD YOUR BOAT THIS WINTER

so it will be ready to launch next spring when the boating season opens. Whether it's a simple rowboat, an outboard runabout or a family cruiser, you'll find something you want among our blueprints. These are some of the popular prints in the list:



21-Ft. Sloop "Arrowhead"—944 to 951

"ARROWHEAD" SLOOP—944 to 951: 21-ft. sailboat that can be built by average craftsman. Accommodates up to 10 passengers. Set of 8 prints \$1.50.

"HI-HO" 14-FT. FAMILY RUNABOUT—840 to 845: Powered by 11 to 22 hp. outboard or a converted Ford motor. Set of 6 prints \$1.00.

12-FT. ROWBOAT—707: Flat bottom. Can be used with small outboard motor. 25c.

"SEA SAUCER"—893: Lightweight sailboat. Length 9½ ft. Planked with 3/16-in. plywood. 25c.

10-FT. ROWBOAT AND AUTO TRAILER—551: Wonderful combination for week-end trips. 25c.

SECTIONAL ROWBOAT—905: Length 12 ft. Three sections occupy space only 6½ ft. long when nested. 25c.

CANVAS-COVERED KAYAK—928 and 929: Light framework covered with canvas. 17 ft. in length and accommodates single passenger. Two prints 50c.

DOUBLE-END DUCK BOAT—703: 10 ft. long. Wooden frame covered with canvas. Can be carried on automobile. 25c.

Any six of these blueprints (not sets of prints) will be sent postpaid upon receipt of \$1.00

Blueprint Department, Popular Mechanics Magazine, 200 E. Ontario St., Chicago



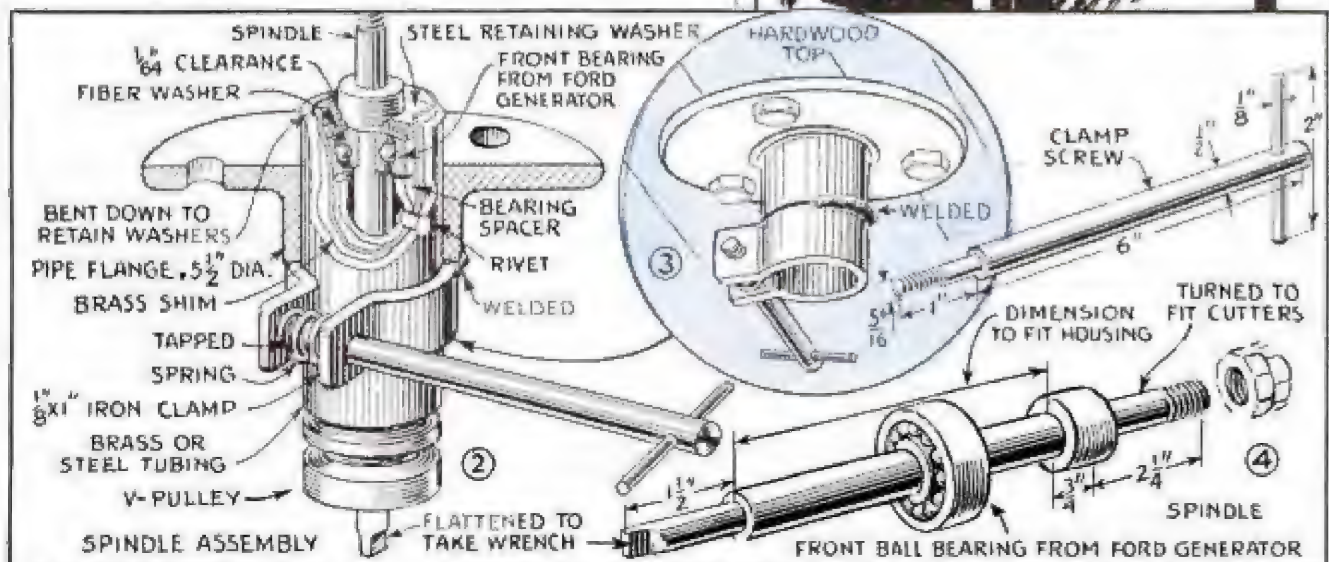
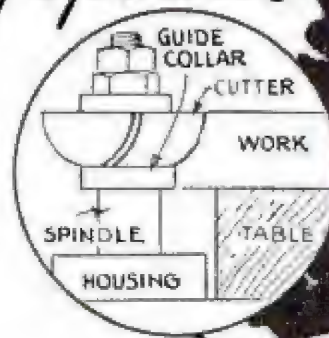
SHOP NOTES

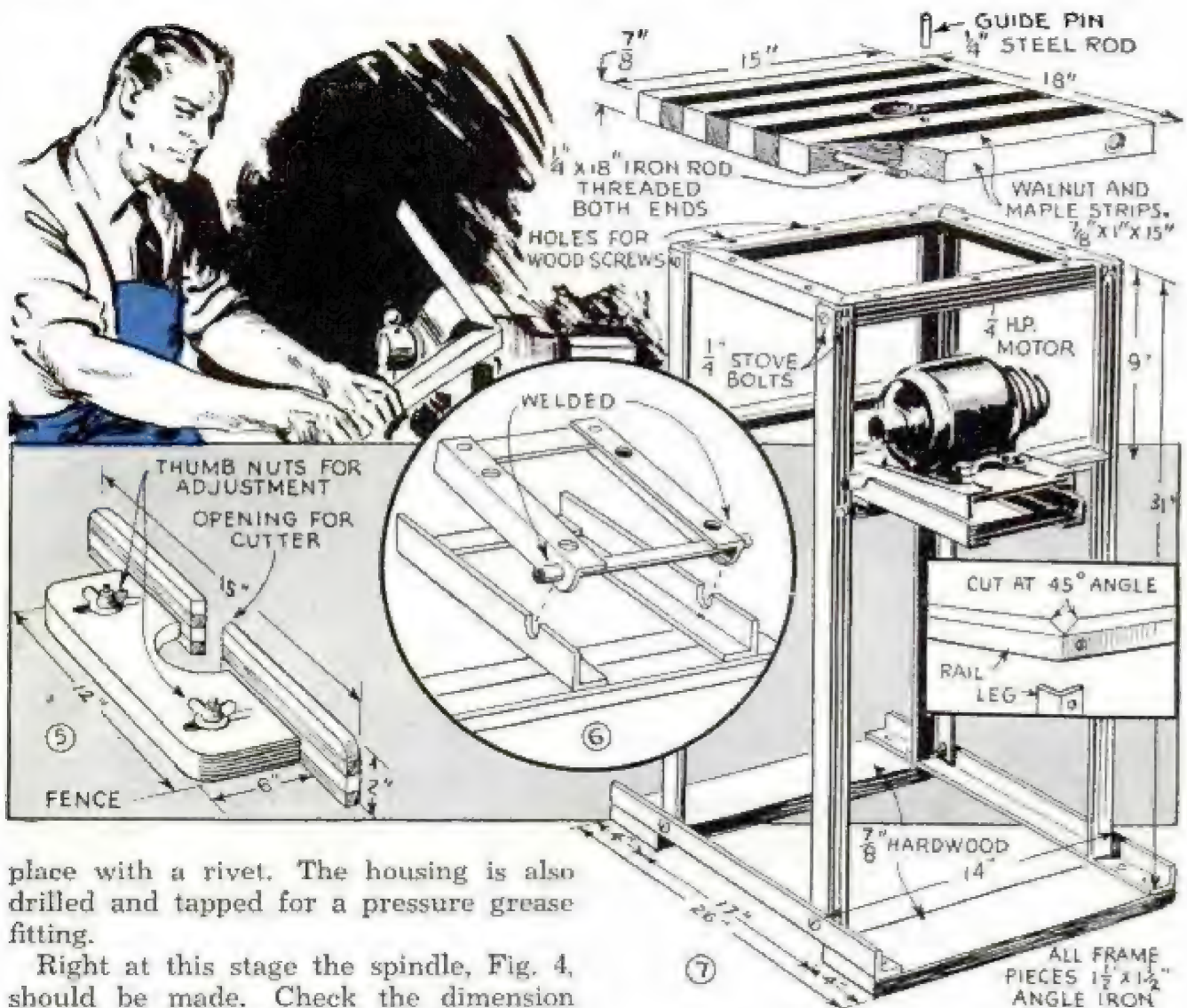
Homemade SHAPER *has ball-bearing spindle*

By ALBERT C. LARSON

WITH this shaper set up ready for work you are independent of the limitations of stock moldings, for, with an assortment of cutters you can make practically any molded shape you may require in a few minutes time.

The greater part of the story on construction of the spindle is told in Figs. 2, 3 and 4. The spindle assembly is housed in a 5-in. length of brass or steel tubing. This length is only an approximation for you may have to file the ends back slightly to get proper fit of the retaining washers. Note especially from Fig. 2 that there is an inner tube which acts as a bearing spacer and that between this and the housing proper is a light sheet-metal shim. The shim extends beyond the ends of the housing and the whole thing is held in





place with a rivet. The housing is also drilled and tapped for a pressure grease fitting.

Right at this stage the spindle, Fig. 4, should be made. Check the dimension through each of the inner ball races before you turn down the spindle between the cutter flange and the shouldered lower end, for this section must fit the inner ball races in a snug, press fit. Thread the upper end of the spindle while in the lathe as the thread must be true. When you assemble as in Fig. 2 make sure, before seating the retainer, that the spindle turns freely, without perceptible binding at any point, through a complete revolution.

Next, you bore out the threaded sleeve of a pipe floor flange so that the spindle housing is a smooth, sliding fit. Then a clamp is bent from flat iron and welded to the lower end of the flange as in Fig. 3. One of the clamp projections is tapped; the other is drilled with a body drill to take the shouldered end of the clamp screw, Fig. 4. A coil spring is placed between the ends of the clamp when the screw is turned into place.

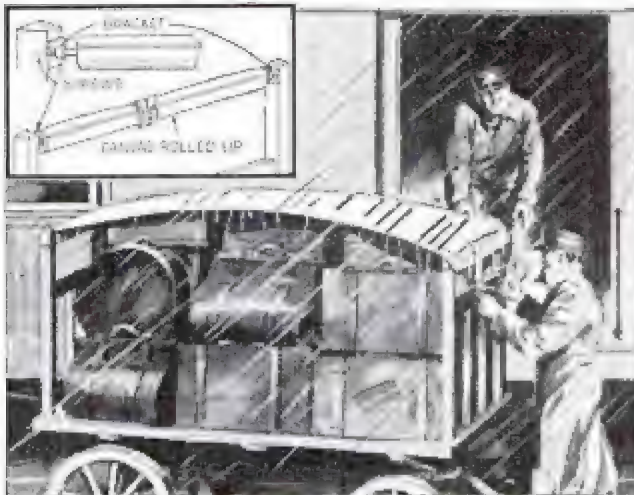
Figs. 5, 6 and 7 show how the spindle may be mounted on a convenient floor stand and driven with a 1/4-hp. motor. Fig.

6 suggests a good method of mounting the motor with the shaft in the horizontal position and driving with a half-crossed round leather belt. But, if you have a ball-bearing motor, you can simplify this installation by mounting the motor with the shaft in the vertical position. In either case, with a motor running at 1,750 r.p.m., you can use a 7-in. V-pulley on the motor shaft and a 2-in. pulley on the spindle. This combination will give the proper speed for the average work. The stand, as you see, is a very simple affair made from angle iron. The table top requires a little more care. It should be made of strips of hardwood glued together and drawn tight with iron rods threaded at both ends for a nut and washer. For accurate work it's essential that the table top be surfaced smooth and flat on both sides. Finish it with shellac. Notice the guide pin, Fig. 7, which is necessary for starting the work when no fence is used. It should not be more than 3 in. from the center or axis of

the spindle. When using the pin as a guide for the edge of the work when starting the cut, it is essential that the uncut portion of the stock ride on a guide collar as in the detail, Fig. 1. Although the pin can be used when starting either straight or curved work it's best to use a fence when molding straight stock. Fig. 5 suggests a simple type of fence, although it does not have an adjustment for offsetting the two halves which is necessary on certain kinds of work. A ready-made fence having this feature can be purchased at nominal cost. Three-lipped cutters should be used. They may be purchased ready-ground in a great variety of shapes together with suitable guide collars. Always use double nuts on the spindle and be sure that they are tight before starting the machine.

Roll Top on Baggage Truck Protects Load in Rain

To protect suitcases and parcels on a baggage truck when loading or unloading it during a rain, the agent at one railroad station provided the truck with a canvas top, which could be pulled quickly in place when needed. The canvas is wound around a roller, which is suspended between the



Canvas roll top for baggage truck at railroad station is quickly pulled in place when needed during a rain

truck corner posts at one end where it is held tightly rolled with a strap. When a cover is needed, it's a simple matter to unroll it and pull it over the top of the truck.

☐ Placing a piece of rubber matting in a developing tray will prevent negatives from sticking to the bottom.

Window Trimmer Saves Steps by Using Large Mirror

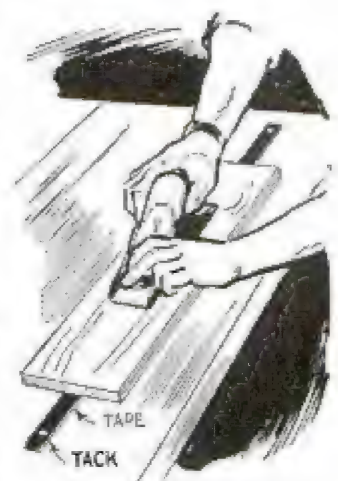


Window trimmer can see how display looks from street by watching reflection in a mirror

Instead of taking time to walk outside several times to see how a show window looks as the work of arranging a display progresses, one trimmer uses a large mirror on a standard, which is placed outside on the sidewalk. This enables him to do the trimming and get the desired effect by watching the reflection in the mirror. Use of a mirror will be found particularly handy where the merchandise is displayed close to the glass.

Electrician's Tape Holds Pieces for Planing

The difficulty of planing thin pieces of wood, for want of some device to hold them, may be overcome in many instances by tacking a strip of electrician's friction tape to the workbench, with the sticky or gum side up. When the pieces are placed upon this surface, they will remain in position under ordinary planing pressure.



Wire Basket on Sliding Ladder Saves Time in Shoe Store



Shoe clerk can take several boxes of shoes from upper shelves when using this removable basket

Fastened to one rail of a sliding ladder in a shoe store, a wire basket will enable a clerk to remove several boxes of shoes from upper shelves and take them down in one trip. The basket is a wire file basket to which a hook is soldered to slip in a bracket bent from sheet metal.

Heavy Duty Belts Improvised from Old Truck Tires

An operator of a portable feed grinder in one rural community has a novel arrangement, which has saved him many dollars on belts. As the motor and grinder are mounted close together on the truck



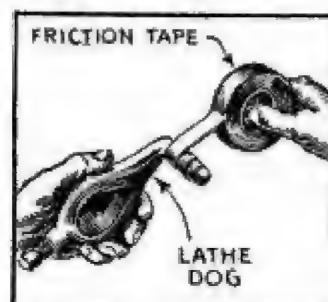
Old truck tires make good belts when the motor and machine are mounted close together

frame, he is able to use a belt which he made from an old truck tire. This was done by cutting away the side walls of the tire about 1 in. from each side of the tread. In use, the tire is turned wrong side out so that the rubber surface lies next to the pulleys. It is claimed that these belts are durable and do not slip under heavy loads.

—Austin J. Griffin, Honey Creek, Ind.

Noisy Lathe Dog Silenced by Wrapping of Tape

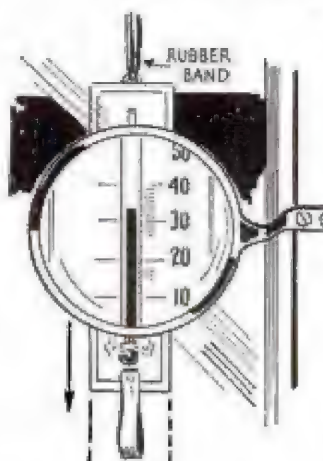
Noise made by a lathe dog striking the faceplate, when running the lathe without taking a cut, can be quieted by wrapping tape around the end of the dog as shown.



The tape provides a cushion, which prevents a metal-to-metal contact between the dog and faceplate.

—Burl Knutson, Bismarck, N. D.

Refrigerator Thermometer Hung Behind Magnifying Glass

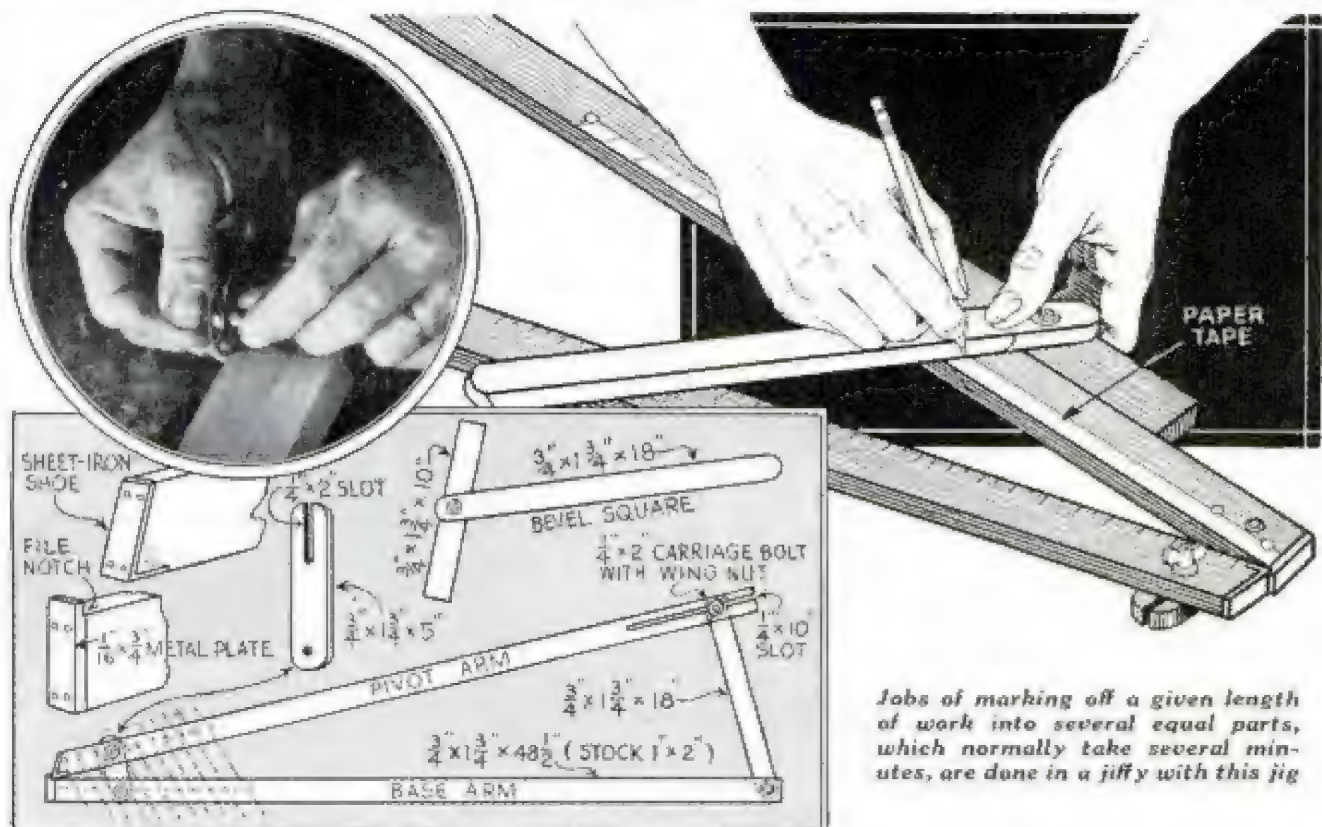


To avoid waste of time in reading the thermometer in his refrigerator, one butcher suspended it on the wall with a rubber band with a small magnifying glass permanently fixed in front of it. A strap at the bottom of the thermometer allows

the instrument to be pulled down so that the reading can be taken when the mercury column is at any height. When at rest, the rubber band holds the thermometer so it is easy to read the lower figures without adjustment.

Plaster busts or ornaments can be cleaned by applying a liberal coat of heavy starch. After the starch has dried thoroughly, remove it with a brush.

Work Divided into Equal Spaces with This Jig



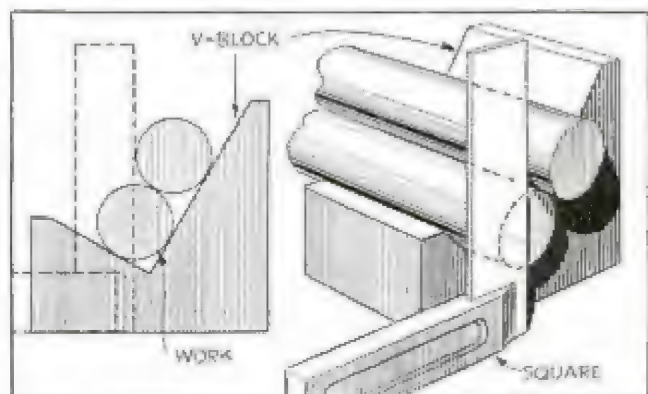
Jobs of marking off a given length of work into several equal parts, which normally take several minutes, are done in a jiffy with this jig

On work where it is necessary to divide a given length into several equal spaces, such as some jobs in shops making novelties and models, this dividing jig will save time. To make it, square two strips and shoe one end of each with iron as indicated at the left side of the detail, providing a reasonably long-lived pivot for the two arms of the jig. Calibrate the pivoted arm to any convenient unit. An easy way is to roll a clock wheel along the piece near the inner edge so that the teeth make light imprints. Mark every fifth imprint with a

sharp lead pencil and every tenth one with a longer line, and number the larger units. Make two adjustable crosspieces to lock the arms in position. To use the jig, stretch paper tape on the base arm, the left end even with the pivot. Open out the pivot arm and adjust a bevel square so that the blade edge passes through the right end of the strip and an arm calibration corresponding to the number of divisions required. Shift the square from division to division, marking across the strip, and then use it to mark the work.

Quickly Locating Shaft Centers with a V-Block and Square

This special V-block enables you to locate quickly the center of a shaft, using two of the same diameter and a square as shown. After the block has been machined square, scribe a vertical line in the center, and some distance above the bottom, scribe a circle with the line as the center. Next scribe another circle the same size as the first one, touching the vertical line and the edge of the first circle. Now, scribe a line touching the edge of both circles and another at right angles touching the first circle. Machine the vee carefully to these lines.



A second shaft of the same diameter as the one to be centered is used, against which the edge of a square is rested

Burrs Left by Drill Inside Boilers Quickly Removed

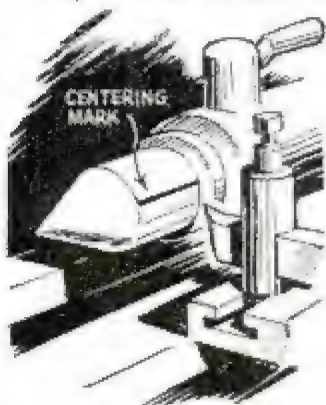


This tool quickly removes burrs from holes drilled through boilers and other cylindrical objects

After drilling holes in a boiler to fit cylinder and mounting-block bolts, it is essential that the burrs left by the drill should be removed from inside the boiler. If this is not done, the burrs are likely to cut into the bolt and cause a leak later on. A simple tool for removing the burrs can be made from a steel bar as shown. In use, the bent end of the tool is inserted through the drill hole, after which it is swung around, the bent, pointed end scraping away the burrs.

—F. Doughty, Shipley, Yorks, England.

Lathe Tools Are Set Accurately by Guide on Tailstock Center



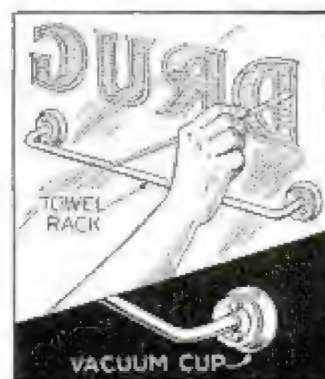
Here's an easy method I use for setting lathe tools, which have been changed or sharpened while the work is still between centers. After once centering the tool on the work, the carriage is moved back to

the tailstock center, the point of the tool moved up to touch it, at which point a

short scratch is made on the center. The mark thereafter serves as an accurate guide in setting the tool in the center of the work unless the tailstock center is moved.—Burl Knutson, Bismarck, N. D.

Sign Writer's Hand Support Sticks to Glass

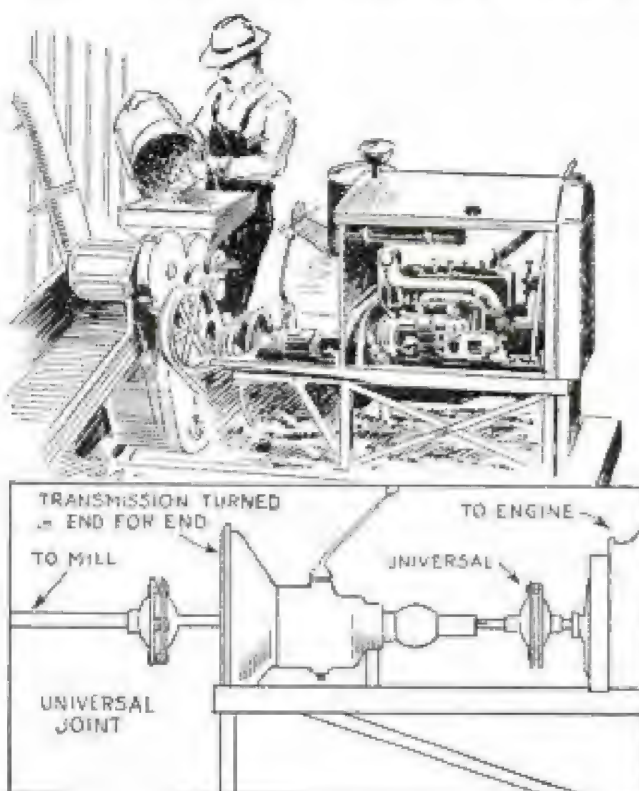
Fitted at the ends with small vacuum cups, an ordinary metal towel rack makes a good support which can be stuck to the window glass to steady a sign-writer's hand. The vacuum cups can



be attached to the end of the rod in one of several ways, using glue, cement, etc.

Grinder Driven by Transmission from Old Auto

Farmers and others who have only occasional use for a belt to drive a feed grinder or other heavy machines will find that they can save considerable money on



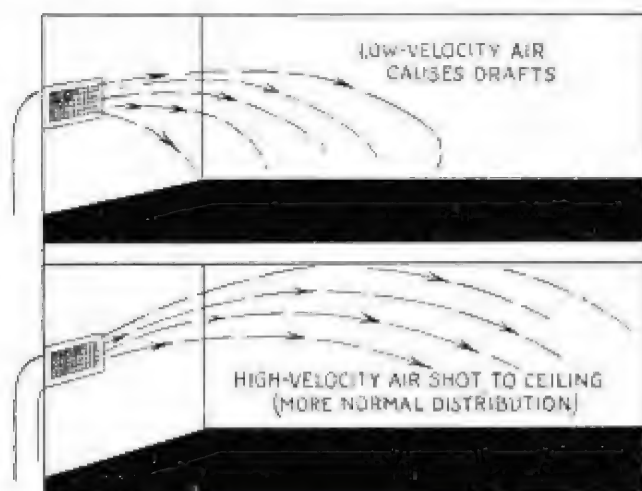
Farmer's feed grinder driven through old auto transmission saves belts, which soon rot

belts, which soon rot when not in use, by driving the machines directly through an old auto transmission. Besides taking the place of a belt, the transmission offers them a choice of three speeds. The transmission is turned end for end, or opposite to its position in the car, and run in second to give a $1\frac{3}{4}$ to 1 over drive. It is bolted to the frame of either the machine to be driven or to the frame of the motor and is connected to either of the latter by means of drive shafts and universal joints. In the lower detail, the transmission is shown mounted on the motor frame, a universal joint being installed in the drive shafts between the transmission and motor and between the transmission and the feed mill.

—H. G. Walker, St. John, Kans.

Installing Wall Grilles in Homes for Air Conditioning

After installing air-cooling systems, it is often noticed that some rooms feel rather drafty. The cause of this trouble will be found in the wall grilles where the air escapes into the room. Air coming through the grilles at low velocity falls to the floor



Too large grilles in cooling installations reduce air velocity into the room and cause drafts

about the center of the room, thus giving the impression of drafts to the occupants. One engineer avoids this trouble by installing wall grilles small enough to emit the air at a high velocity so that it is driven across the room above the heads of the occupants.—L. H. Georger, Buffalo, N. Y.

By exposing sensitized paper to a dark-room light and then developing it, you can determine if the light is satisfactory.

This Carving Board Has Prongs to Hold Meat Firmly

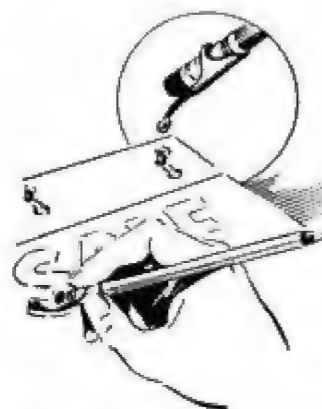


Roasts, chickens, etc., are easily sliced when impaled on the prongs of this carving board

The chef in one restaurant uses a novel carving board, which has two wooden prongs projecting through it to hold roasts, chickens, etc., while slicing them. The prongs are merely pointed, hardwood pegs which are driven tightly into holes bored through the board.

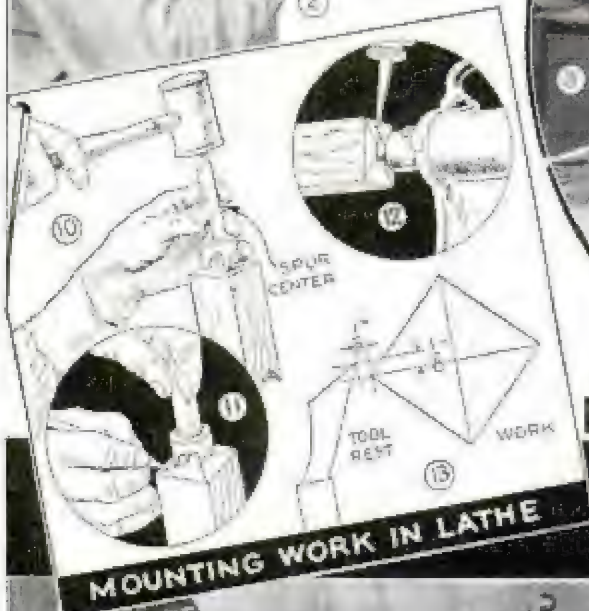
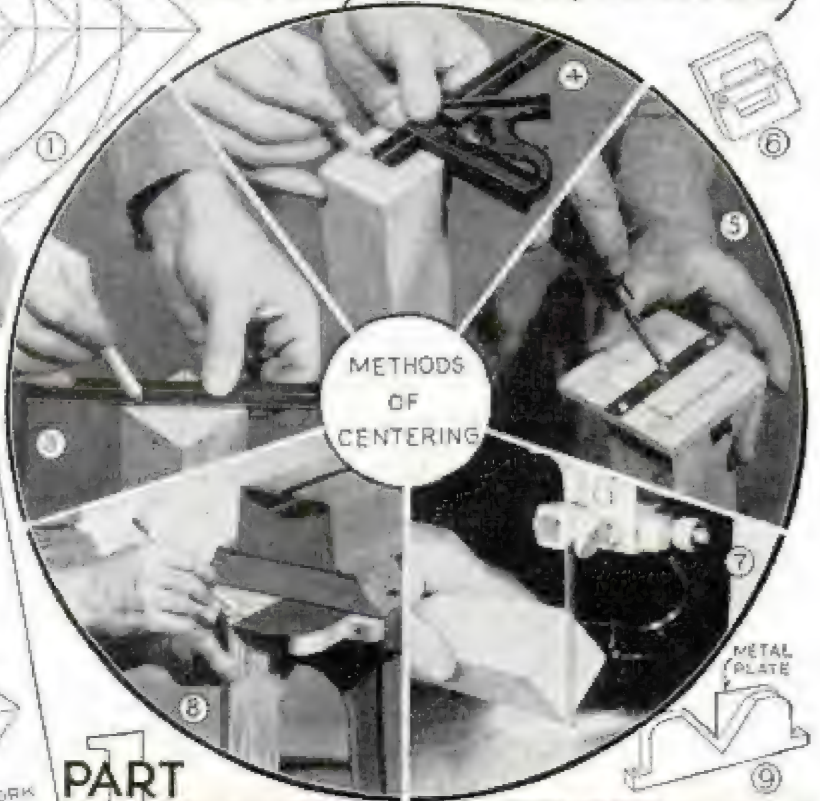
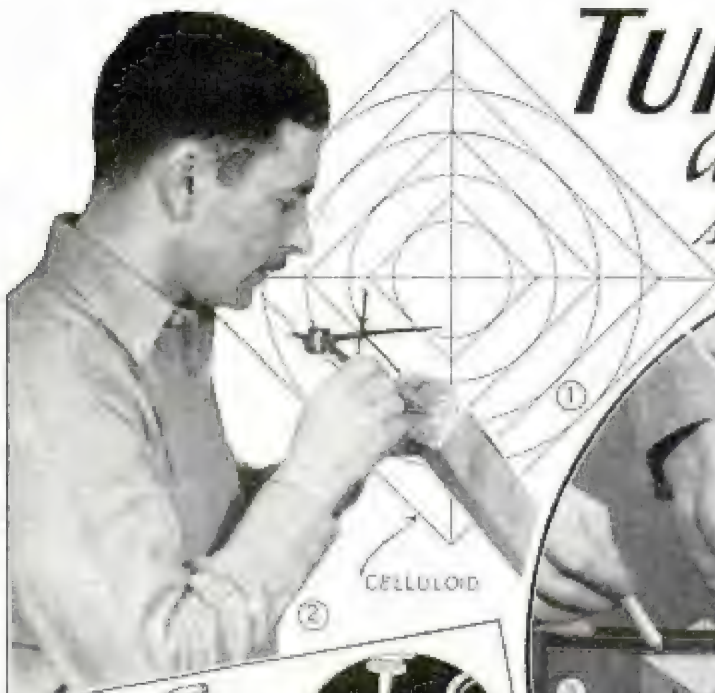
Ball Clip of Pencil Makes Stylus to Shade Letters on Stencils

When a shading plate, or screen, is employed to shade open letters on a mimeograph stencil, the work can be done efficiently by using a pencil clip as a special stylus, as it will rub through the shading surface without tearing the stencil like the ordinary wire loop stylus so commonly employed is apt to do. The clip is reversed on the pencil, which serves as a handle.



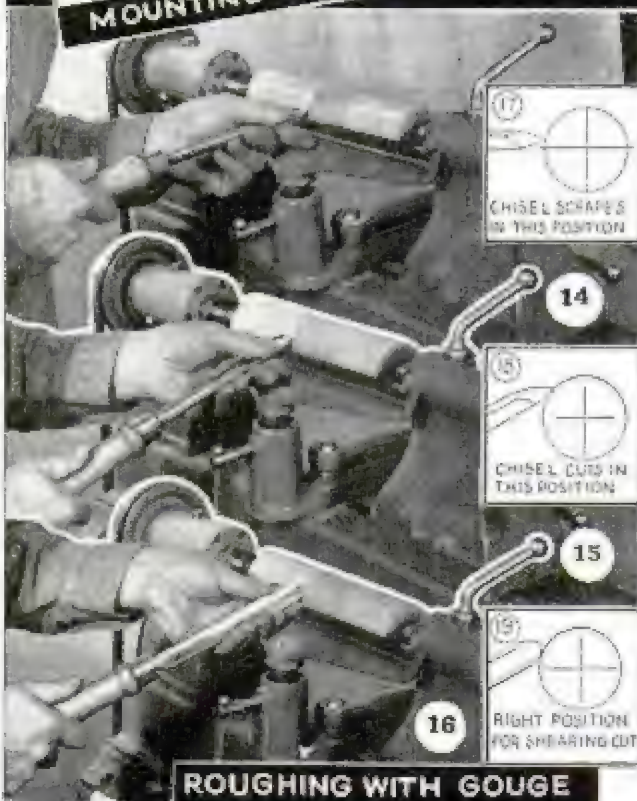
TURN RIGHT!

A complete guide to successful wood turning



PART

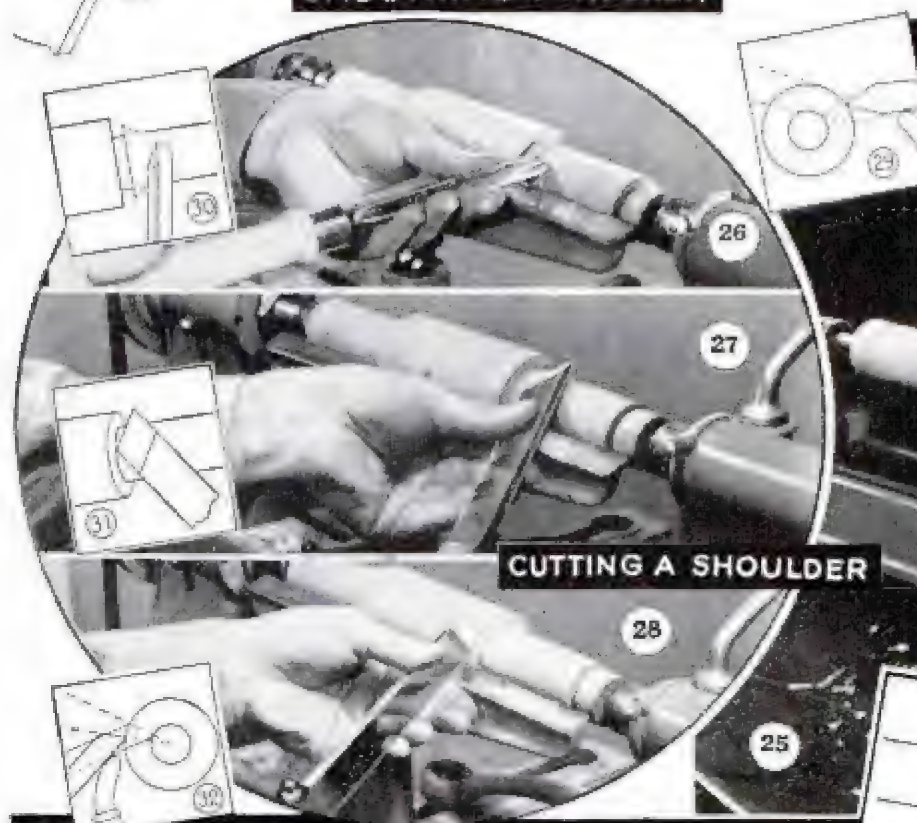
1 SPINDLE



SPINDLE turning between centers is the groundwork for all wood lathe operations. The first step in making a spindle turning is centering the stock. The latter should be square, or nearly so, and the center at either end located and marked by any of the methods shown in Figs. 1 to 9 inclusive. After centering, the spur center is driven into one end of the work with a mallet, as shown in Fig. 10. Never drive the work onto the spur center in the lathe. Since the spurs of the center may not be exactly alike, nick one of them with a file and make a pencil mark opposite the nicked spur as in Fig. 11. Thus marked, the work may be removed from the lathe at any time and accurately re-centered when it is again mounted for turning. Mounting the work between centers is done by advancing the tailstock cup center



SMOOTHING WITH SKEW

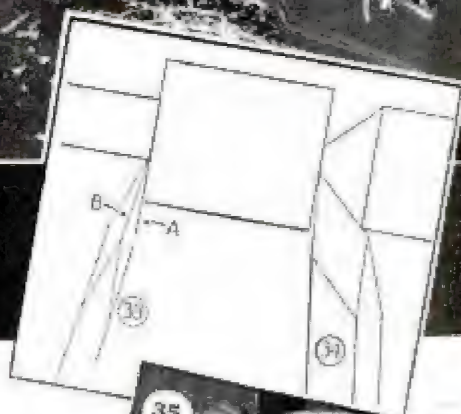


CUTTING A SHOULDER

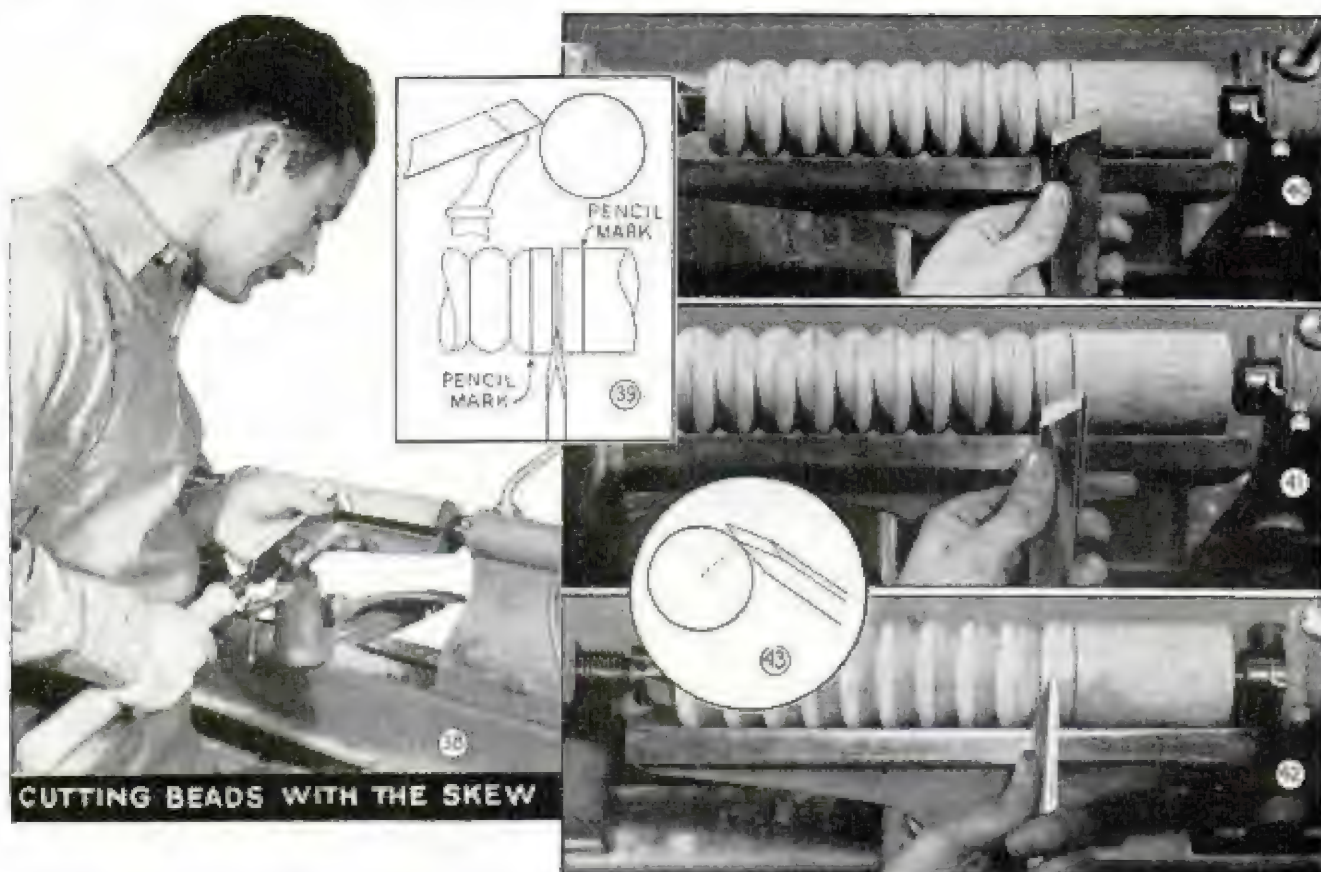
TURNING

into the work while the latter is being turned by hand. When the stock binds, the tailstock is backed off about one-quarter turn and locked. Apply a few drops of oil, as in Fig. 12, to prevent the wood from burning the cup center. Many turners use tallow or wax for lubricant, since this does not stain the wood. Fig. 13 shows the relative position of the tool rest with the axis of the work. As the square is turned into round, the rest is moved up by stages. About $\frac{1}{8}$ in. above the axis and the same distance from the surface, is a fair rule to follow, although there are variations, of course.

The first turning operation is the "roughing cut," made with the gouge. Figs. 16 and 19 show the proper position—the bevel should be tangent to the work, and the tool rolled on its side. Figs. 14 and 17 show the wrong position, resulting in a scraping action. The position shown in Figs. 15 and 18 permits the chisel to cut, but lack



VEE GROOVES



of clearance prevents the easy, shearing cut possible with the correct position, Fig. 16. The final smoothing of the cylinder after roughing is done with the large skew chisel, the correct position being shown in Fig. 20, with the cut moving toward the right. By reversing the position of the chisel, the cut can be carried equally well to the left. The edge of the chisel should be tangent to the work, Fig. 21, and should contact the surface at the point indicated. The secret of successful smoothing with the skew lies in using the bevel of the chisel as a fulcrum, Fig. 22. If the handle is too low, the edge will not cut, Fig. 23, while if the handle is too high, Fig. 24, the edge will not be supported and will have a tendency to draw into the wood.

Next, the various diameters of the turning are set off with the parting tool, Fig. 25. The calipers are set slightly oversize, and are held against the revolving work until they slip over the stock remaining at the bottom of the groove. This is a scraping cut, which is the safest. A better action is obtained if the lower edge of the chisel is kept approximately tangent to the cylinder, Fig. 29, but the tool is a bit more tricky to handle.

Following the parting tool, Figs. 26, 27, and 28 picture the cutting of a shoulder. In

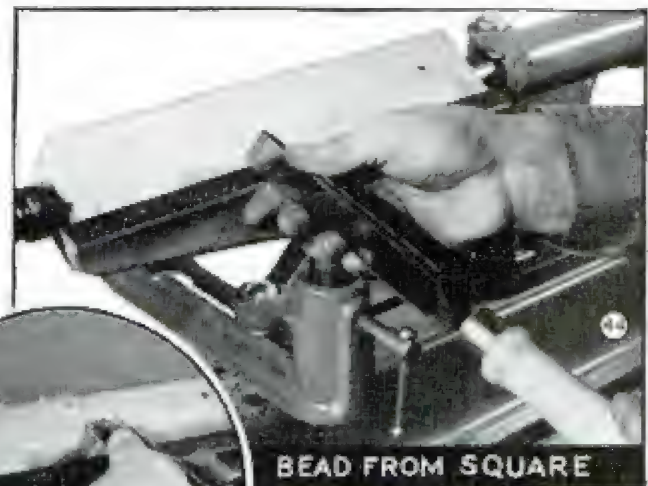
the first operation, the waste is cleared away with the gouge, Figs. 26 and 30. The heel of the skew is then used to smooth the new surface squarely into the shoulder, Figs. 27 and 31, while the toe of the skew is used to dress the shoulder smooth and to exact size, Figs. 28 and 32. When using the skew in this last position, the cutting edge should at all times point toward the center of the work, Fig. 32. A still more important point in making this cut is shown in Fig. 33. Here the line "B" is the cutting edge of the chisel; line "A" is the bevel. Notice particularly that the bevel A is exactly parallel with the cut surface, while the cutting edge is slightly turned away. The same general technique used in cutting a shoulder can be used for clearance cuts or for making vee grooves, as in Fig. 34. Vee grooves can also be made with the heel of the skew, as in Fig. 37. From this position, the handle of the chisel is raised to hinge the cutting edge into the wood. The same rule about not engaging the full cutting edge applies. Slightly exaggerated, Fig. 35 shows how the edge of the chisel is almost, but not quite, parallel with the surface being cut. This is correct. Fig. 36 shows the edge of the chisel exactly parallel with the cut surface, which is incorrect. When the edge is thus engaged, a

"run" invariably results. Keep in mind that a point, either toe or heel, cannot run. It is only when the whole edge or a considerable part of it is engaged, as in Fig. 36, that runs occur.

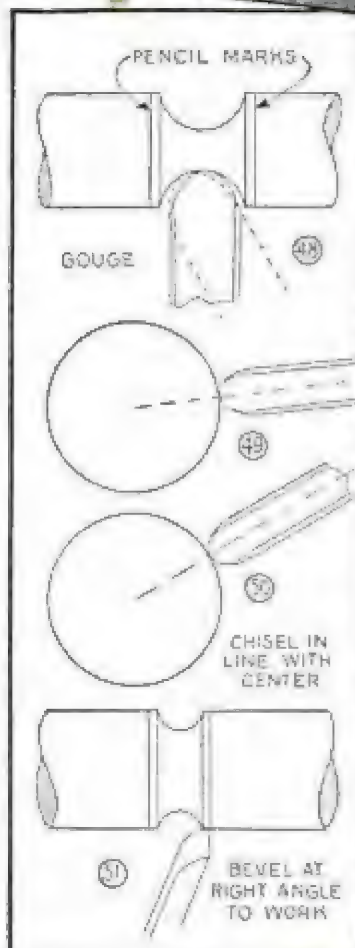
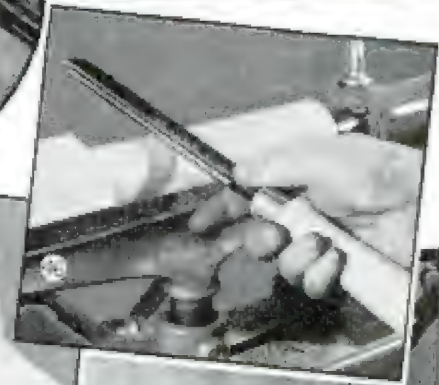
Figs. 38 to 42 inclusive show successive stages in cutting a bead. The center of the depression should be marked first by running in with the toe of the skew, as shown in Figs. 38 and 39. Starting the cut from the position shown in Fig. 40, the chisel is slowly rolled to the left and simultaneously the handle is raised to keep the bevel in contact with the wood. The essential point in cutting a bead is shown in Fig. 43—the bevel of the chisel should be tangent to the work. In this position, the chisel cannot run.

Quite often, a bead must be cut from a square portion of the turning. When this is done, the work is first nicked with the point of the skew, Fig. 44. After nicking, the round portion of the turning can be roughed out without any danger of splintering the square part, Fig. 45. After the round portion is turned down to a true cylinder—this is easily checked by placing the chisel flat on the revolving work to detect any "hammering" action, as shown in Fig. 46—the bead itself can be cut. This can be done in the same manner as previously described, although many turners prefer the simpler scraping operation with the toe of the skew, Fig. 47.

Figs. 51 and 52 show the start of the difficult cove cut, and Figs. 53 and 54 show the slight rolling action of the gouge as the cut progresses. Pencil marks are first made to indicate the edges of the cut, and the excess wood inside the marks is removed with the gouge, using a scraping position,



BEAD FROM SQUARE



COVE CUTTING



Fig. 48. The entire cut can, of course, be made in this manner, the practice being quite common even among experienced turners. To proceed with the rolling cut, the first essential point is that the gouge must point to the exact center of the work. Whether the tool rest is low, Fig. 49, or high, Fig. 50, this same rule applies. The reason for this is simple: The exact point of the gouge which is thus engaged cannot run. The second essential point is shown in Fig. 51—the bevel of the gouge must form an exact right angle to the surface of the work. From this position the gouge is rolled into the cove, making one-half of the cut in one operation, and the opposite side of the cut in a second operation which is a reverse of the first. It's important that the tool handle be swung through an arc simultaneously, so that the bevel will as-

sume the same relative position throughout the operation.

When the basic cuts have been mastered the turner can do any ordinary spindle turning. The essential points are illustrated in Figs. 55 to 60 inclusive. The first step after smoothing the cylinder is to mark off the dimensions. This is best done with a layout board. A layout board is simply a thin piece of wood on which is drawn a full-size half section of the proposed turning. Placing the board against the cylinder, the turner



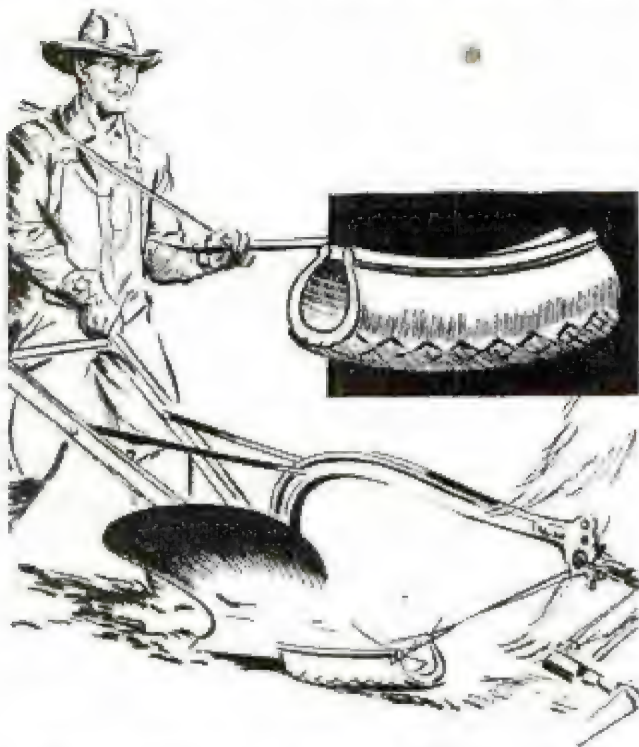
can quickly mark the various points along the turning, as in Fig. 55. Many turners place the board flat on the tool rest, Fig. 56, and mark the work while it is revolving. After marking the required lengths, the diameters are picked off, as shown in Fig. 57, and the caliper setting is then used in making the initial parting-tool cuts, and then the various forming cuts are made. A spindle turning properly cut is perfectly

smooth and should require but very little sanding. When sanding, remove the tool rest. Use very fine sandpaper, and keep it constantly in motion along the length of the turning to avoid scoring. The usual practice is to reduce the diameter at either end of the turning to about $\frac{3}{16}$ in., and then cut the work free with the skew chisel at the driven end, as in Fig 58. The left hand lightly encircles the work, and prevents it from being thrown from the lathe. Slender spindle turnings will vibrate under the pressure of the chisel, making smooth cutting impossible. To eliminate this vibration, a center rest should be used. If the turner is not equipped with a center rest, good results can be obtained by using a simple back rest or back stick, as shown in Fig. 60.

(To be continued)

Walking Plow Pulled on Runner to Keep It Out of Ground

When moving a walking plow from field to field, a section of auto tire fastened to the beam to extend back under the point



When a piece of auto tire is held under the plowshare you can move a walking plow easily

of the plowshare will keep it from digging into the ground. When not in use, the piece of tire can be removed or tied up to the beam out of the way.

—G. E. Hendrickson, Argyle, Wis.

Dolly to Move Heavy Boxes in Your Store



Heavy boxes and crates up-ended on this V-block dolly are easily moved

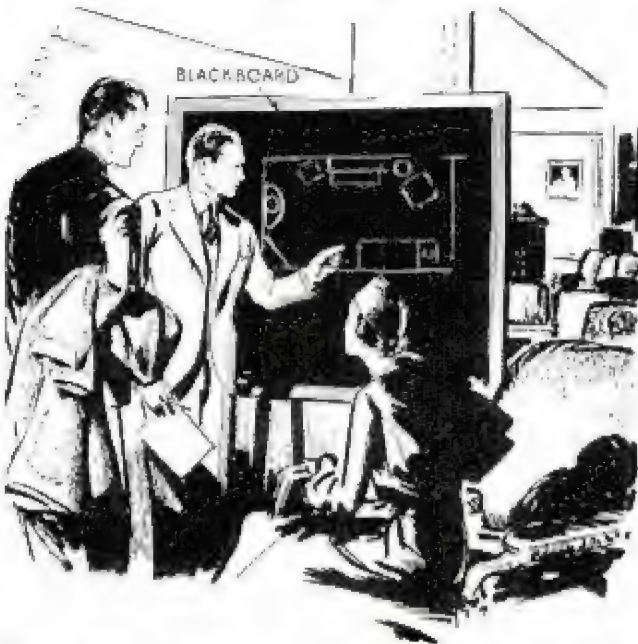
In stores where an occasional job of moving heavy boxes does not warrant the purchase of a hand truck, this dolly will enable you to do the job easily. It is made by sawing out a large V-block from a piece of wood and screwing it to a roller skate. A small rope fastened to one end of the block with an eye bolt serves as a handle.

Microscope Specimen Measured with Thickness Gauge

Microscopists will find a thickness gauge a handy tool in their work, as it enables them to determine readily the thickness of any section. This may be done by using a high-power objective and focusing very sharply on the top of the section to be examined. Then, leaving the setting fixed, move the slide so that the specimen is out of range and insert the gauge under the objective, trying different combinations of the gauge leaves until a sharp focus on the top leaf results. A good gauge will measure a specimen as thin as .0015 in., or, if a metric gauge is used, .04 mm. This method can be used in the shop for determining thickness of shim stock, paper, etc., when no micrometer caliper is available.

—W. C. Wilhite, Hornsby, Ill.

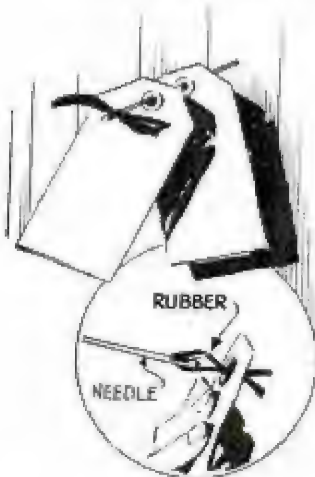
Blackboard in Furniture Store Helps Floor Salesman



By using a blackboard, a furniture salesman shows methods of arranging furniture in customer's home

In order to get an idea of the layout of a prospective customer's home, a floor salesman in one furniture store uses a large blackboard. On this he sketches a floor diagram of the customer's home along with the location of each piece of furniture. With the blackboard, the salesman can illustrate suggestions for rearranging furniture, or he is able to give his customers some helpful idea of what kind of furniture would look best.

Darning Needle Stuck in Wall Keeps Shipping Tags Safe



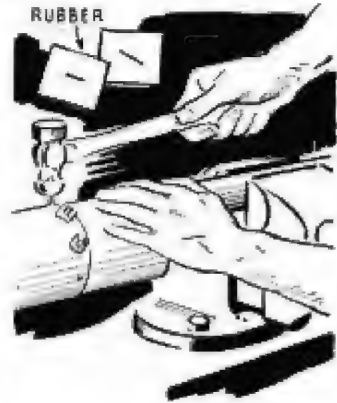
One produce buyer, finding that shipping tags suspended from hooks on the posts of the loading platform were often blown about and wasted, replaced the hooks with large darning needles. These were driven into the posts, as shown, and a section of a large rubber band was threaded through each needle eye. This arrangement permitted the tags to be slipped onto

the holder with very little trouble but their removal was restricted so that they must be pulled off.

Rubber Washers Hold Rivets for Clinching

The problem of holding rivets, when assembling well tubing, cold-air ducts for furnaces, etc., until they could be clinched on a mandrel was solved in one shop by using rubber washers.

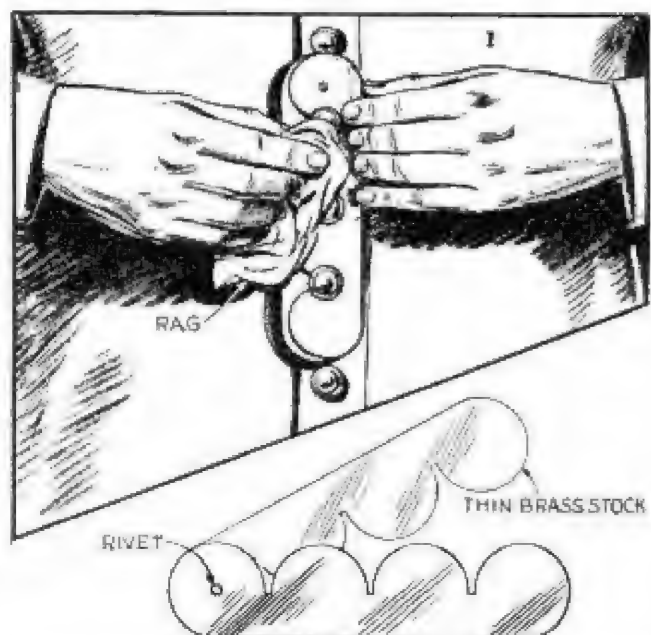
These were square and were cut from an old inner tube, slots being made in the center of each one to slip over the projecting ends of the rivets to keep them from dropping out.



Shield Protects Cloth on Uniform While Polishing Buttons

To avoid soiling the cloth of his uniform while polishing the buttons, one police officer uses this shield, which slips under them as indicated. Cut from thin sheet metal, the shield consists of two pieces, which are pivoted at one end, allowing it to be opened for easy removal.

—Sigmund Sameth, New York City.



Police officer uses hinged shield to protect cloth of uniform while polishing the buttons

Can You SEE THEM IN TIME?



Keep-
ing your
headlights at
top efficiency, is
easier than polish-
ing the car and,
it may save
a life

REMOVE LENSES

LOOK inside the headlamps of cars involved in an accident at night and you will often find dirty or tarnished reflectors, blackened lamp bulbs, mud-spattered lenses, which are the weapons that Death employs to make night driving at least four times as dangerous as day motoring.

Bulb blackening is a good index of headlamp life as it shows the condition of the lamp filament. Automobile lamps do not fail only because their filaments are broken by mechanical vibration or shock—the filaments simply wear out. Switching your headlamps on heats the filaments to such a degree that the tungsten vaporizes slowly. As the diameter of the filament wires becomes less, the wire becomes brittle and finally breaks. The vaporized tungsten condenses on the cool walls of the glass bulb, forming a black deposit as in Fig. 2. This blackening provides a reliable gauge of the condition of the filament, and an indication of when the lamp is about to burn out, for the blackening is greatest just before the end of the lamp's life. Repeated tests have shown that a well-made automobile headlamp is delivering 95 per cent of its maximum candle-



BLACKENED IN USE



NEW LAMP BULB

CHECK
THE LAMP
BULBS





ADJUST CHARGING RATE

power when it is 80 per cent worn out. During the remaining fifth of its life, its light output drops rapidly because of the bulb blackening.

To determine when your headlamp bulbs need replacing, remove the lens, Fig. 1, take the bulbs out, hold them against a sheet of white paper or other white surface, as in Fig. 3, and see whether they are blackened appreciably. Although excessive bulb blackening naturally results in dim lights, dimness may be caused also by low voltage. The generator charging rate may not be high enough to keep the battery fully charged. This is remedied, as in Fig. 6, by adjusting the third brush until the ammeter shows an increased charge when the engine is running at normal driving speed. Loose or corroded electric connections in the lamp circuits will cause dim lights. Careful inspection of fuse clips, switch contacts, junction-box connections, instrument connections, lamp sockets and ground connections will eliminate the

trouble. Burned-out lamps not traceable to natural wearing out of the filaments usually result from too much voltage. Over-voltage may be caused by low water level in the battery, Fig. 9, generator charging rate that is too high, and loose or corroded connections in the battery circuit, Fig. 8, the portion of the electrical circuit between battery and ground and battery and ammeter.

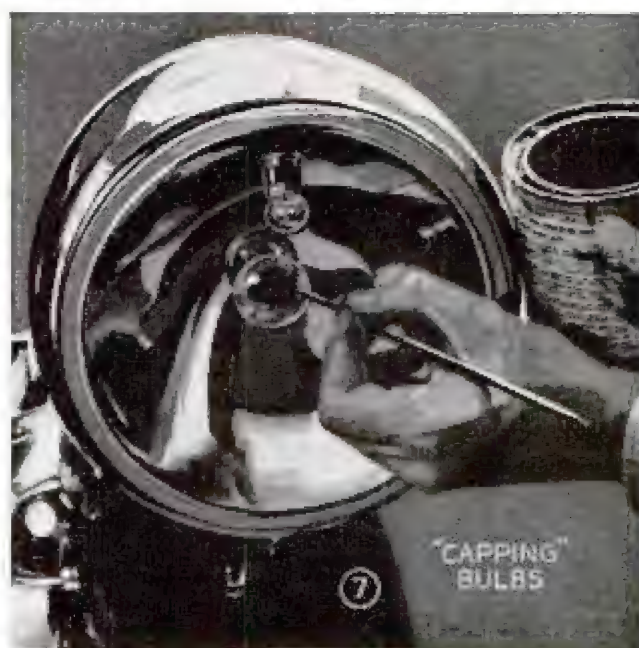
When replacing headlamp bulbs, insist upon the products of reliable manufacturers. The markets are flooded with so-called "gyp" bulbs, some of which are so poorly constructed that satisfactory performance is impossible. Filaments may be so badly centered

that control of the beam is lost. One degree of inaccuracy will shift the beam 21 in. at a distance of 100 ft. The lamp may be crooked in the socket. Presence of water vapor in the bulb, improper evacuation or presence of undesirable chemical conditions may cause the bulb to blacken badly in a few hours of burning, even though the condensation of tungsten vapor is normal.

Headlamp lenses pick up mud and dust with amazing ease, and should be wiped clean whenever such deposits interfere with the light output as in Fig. 5. Wiping the lenses with a clean cloth every evening, before starting out, is a good habit. Alternate heating and cooling of air inside the headlamp causes the lamp to "breathe." This allows dirt to enter the housing and settle on the interior surface of the lenses, and on the bulb and reflector. Reflectors

usually are made of silver-plated brass. Road scum and dust, coupled with a natural dimming of the luster, cause the reflector to lose its efficiency gradually. Twice-a-year cleaning, Fig. 4, will maintain it at a fairly high level.

There are on the market a number of suitable cleaning compounds. You can use one of these, or make up your own cleaner. Simply moisten a quantity of lampblack with alcohol (rubbing, denatured or wood), and use it as a polish. Use a soft cloth free from grit, and do not experiment with cleaning preparations not specifically recommended for reflectors, for the silver surface is very easily scratched. Engineers who have made comparative tests have



CHECK THE WIRING

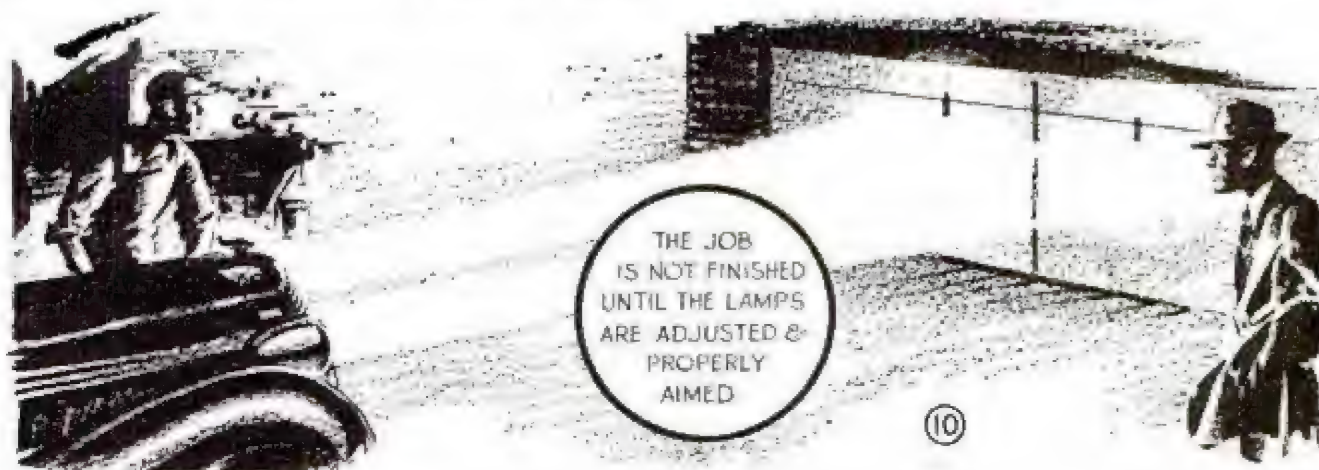


AND TEST BATTERY

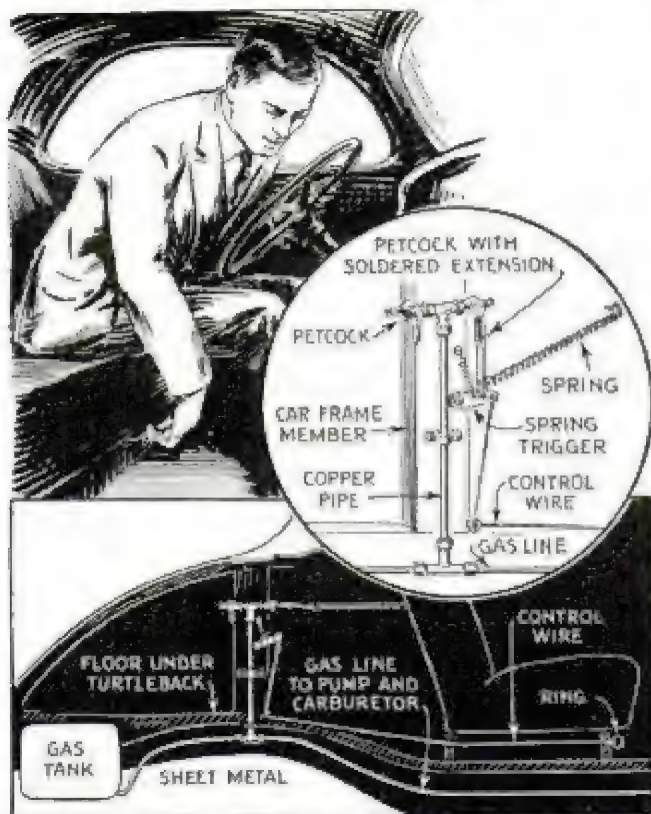
motorists "cap" the ends of the bulbs, as in Fig. 7, with black lacquer to help reduce glare in fog. Most fog is less dense a foot or two from the ground than at a higher level. Therefore a headlamp positioned near the ground will throw its beam under the fog, and provide much better illumination because of less scattering of the light.

failed to find any good reason why fog lamps should be yellow instead of white. About their only merit is that the yellow beam is less intense than a white one from the same sized light source, because much of the light is absorbed by the yellow lens or screen. This naturally reduces the amount of light reflected by the fog. Some

A very slight misalignment between the lamp filament and the reflector may destroy the beam pattern entirely, causing the light to shoot up into the eyes of approaching drivers and fail to illuminate the road surface. Always keep your lights adjusted and properly aimed. A chart, Fig. 10, is an essential to satisfactory adjustment.



Hand-Controlled Gas Line Vent Foils Car Thieves

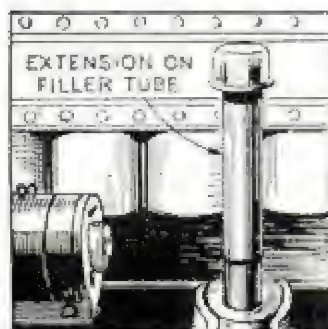


If a bandit enters your car at a stoplight, just open the cock vent to let air in the gas line

Here's a simple way to foil thieves in any attempt to run your car under its own power by merely pulling a ring, which opens a petcock and allows air to enter the gas line and stop the motor. A T-fitting is installed in the gas line to take a length of copper tubing, on the upper end of which is another T-connection and two petcocks. In this case, the installation applies to a coupe, and two cocks are used, one to be operated from the seat and the other extending into the luggage compartment, permitting one or both to be used.

—Robert E. Toms, Riverside, Calif.

Vapor from Oil-Filler Tube Gums Generator Brushes



On some cars that have air-cooled generators, trouble is often experienced by oil vapor from the oil-filler tube being drawn into the generator, causing

the brushes to gum up and stop charging the battery. This trouble is caused by the mouth of the oil-filler tube being too close to the rear end of the generator, and can be prevented by lengthening the tube with an extension piece.

—H. W. Lockhart, Massillon, O.

Grease Kept Out of Rear Brakes by Differential Breather

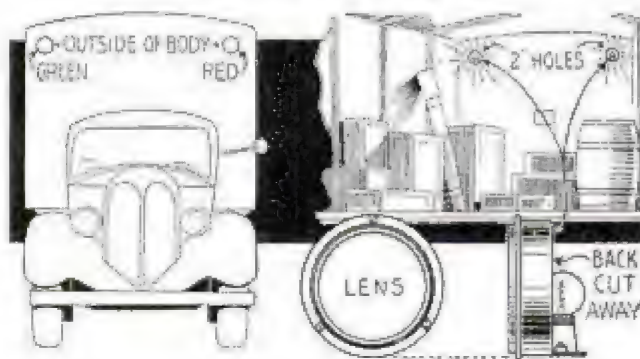
The tendency of grease to work out on the rear brakes of some cars in winter can be prevented by providing a breather in the differential.

Without this, the expansion resulting when taking a car into a warm garage, or driving a cold car until the grease warms up may cause such expansion as to force grease into



the brakes. On the other hand, the contraction may suck grease from the transmission on cars having torque tubes. While this trouble can be stopped by drilling a $\frac{1}{16}$ -in. hole in the axle housing, this is undesirable for it may start a break. It is better to remove one of the upper cap screws that hold the differential cover and drill a $\frac{1}{16}$ -in. hole through it lengthwise.

Interior of Truck Illuminated with Body Lights



By slightly altering front lights on truck body, they are made to help illuminate interior

For truck drivers who make deliveries at night and have no light in the body of the truck, I find that the red and green lamps that most trucks have on the front of the body can be used for the purpose.

First remove the lamps and cut 2-in. holes in the body just behind them. Then take the lens part of the lamp and fasten it on the body directly in front of the hole. Next take the back of the lamp and cut away a section so that the bulb is exposed to give light inside the truck, and place this part behind the hole.

—Russell Lattig, Rockaway, N. J.

Puller for Axles and Driveshafts



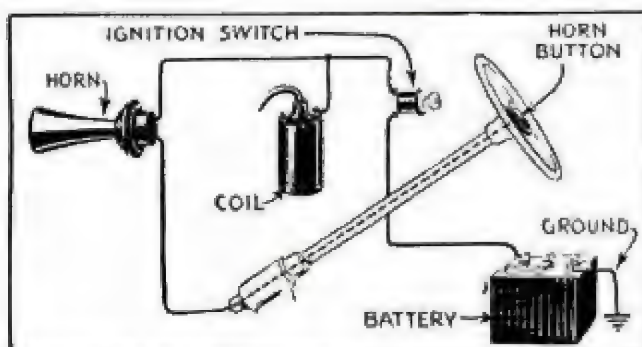
For pulling axles, driveshafts, timing gears, etc., this tool is made easily by drilling and tapping the ends of various size wheel pullers to take the threaded end of a small rod, several inches long. A lock nut

should be used on the rod to hold the adjustment. The end of the rod has a head, against which a knocker, made from a piece of driveshaft, is moved to pull the part.

—Jos. C. Coyle, Phoenix, Ariz.

Horn Can't Be Blown by Children When Connected to Switch

Connected to the "dead" side of the ignition switch, the horn can be sounded only when the motor is running. This idea is especially convenient when the car is parked without locking it and is accessible to children. The horn wire can be connected to the coil wire running to the switch, or a wire can be run directly from the horn to the switch terminal.



If the horn is wired to the "dead" side of the ignition switch, it can be sounded only when motor runs

Loose Bearings Quickly Detected by Simple Pressure System



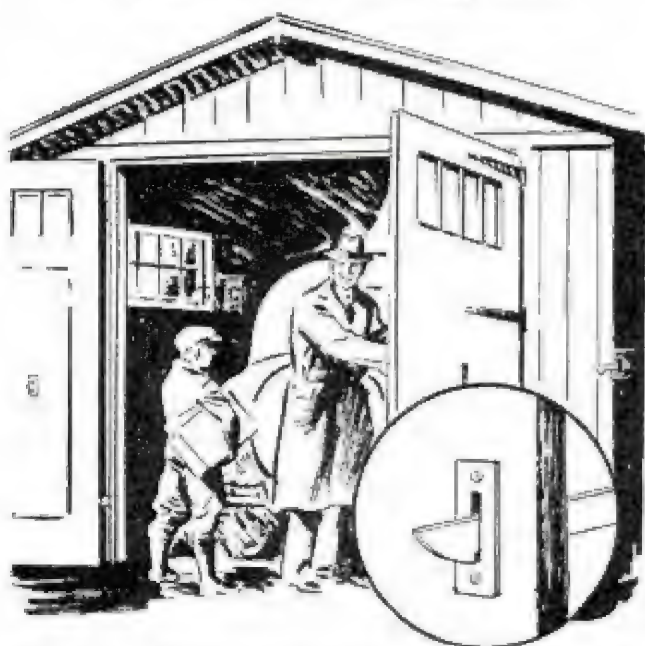
You can locate a loose motor bearing that leaks oil in a jiffy with this simple oil-pressure system

As loose bearings are often the source of oil waste in a motor, this pressure system to quickly locate the offending bearing will save time and money in making a repair. The system consists merely of a pressure tank that can be connected to the oil system of the motor, when the pan is removed, to force oil through it under pressure. The tank is made from a length of 4-in. pipe, which has a metal plate welded to the lower end and a cap fitted on the upper end. The cap is drilled and tapped for a pressure gauge, an air valve and an ordinary tire valve. In use, one gallon of oil is put into the tank, after which air is introduced under 50 lbs. pressure through the valve stem. Then a high-pressure rubber tube from the air valve is attached to the oil system of the motor and the pressure is turned on.

Oil in Cylinder Boosts Off Head

You have a hydraulic jack right in your motor for boosting off cylinder heads where the gasket has been shellacked in place. With all nuts or studs removed, just put a little oil in each cylinder, replace the spark plugs, step on the starter, and the head will be loosened. The pistons coming up against the oil provide the hydraulic action needed.—C. E. Packer, Chicago.

Latch to Engage Garage Doors When They Are Opened



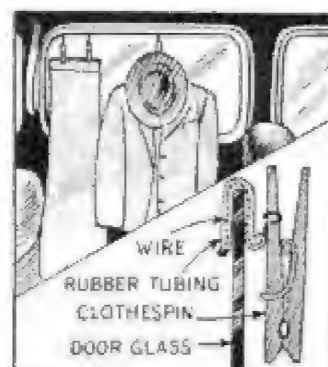
When these doors are opened against the side of the garage they are automatically engaged by latches

To avoid using sticks or rocks to prop open the doors of his garage, one motorist has a pair of latches attached to the sides of the garage so that they automatically

engage the doors when they are opened. The circular detail shows how the latches, which are shaped from a piece of flat iron, slip through slots cut in the doors, the slots being faced with pieces of flat iron to provide long-wearing surfaces for the latches to bear against.

Garment Hook for Car

Fitted with a wire hook, a spring-type clothespin makes a good garment hanger to hook over the lowered window glass of your car. The wire hook, which is covered with small rubber tubing to prevent chipping the glass, can be attached to the clothespin by wrapping one end tightly around one of the legs, or by drilling a hole in the latter to take the end of the wire.



—Don C. Higbee, Cantil, Calif.

The Next Issue

WHAT YOU CAN DO WITH CREPE PAPER

There's no end to what you can do in crepe-paper craft. Cigarette and jewel boxes, pin trays, tie racks, picture frames, pillow covers and many other useful and decorative articles are easy to make by simply applying twisted and braided strips of colored crepe paper over tin cans, cardboard boxes, etc.

TURNING WOOD ON CHUCK AND FACEPLATE

Solves the problem of the inexperienced woodworker in turning balls, disks, rings, bowls, boxes, etc. Tells what to do and shows how to use the chisels.

"BOWL-O"—FASCINATING PASTIME

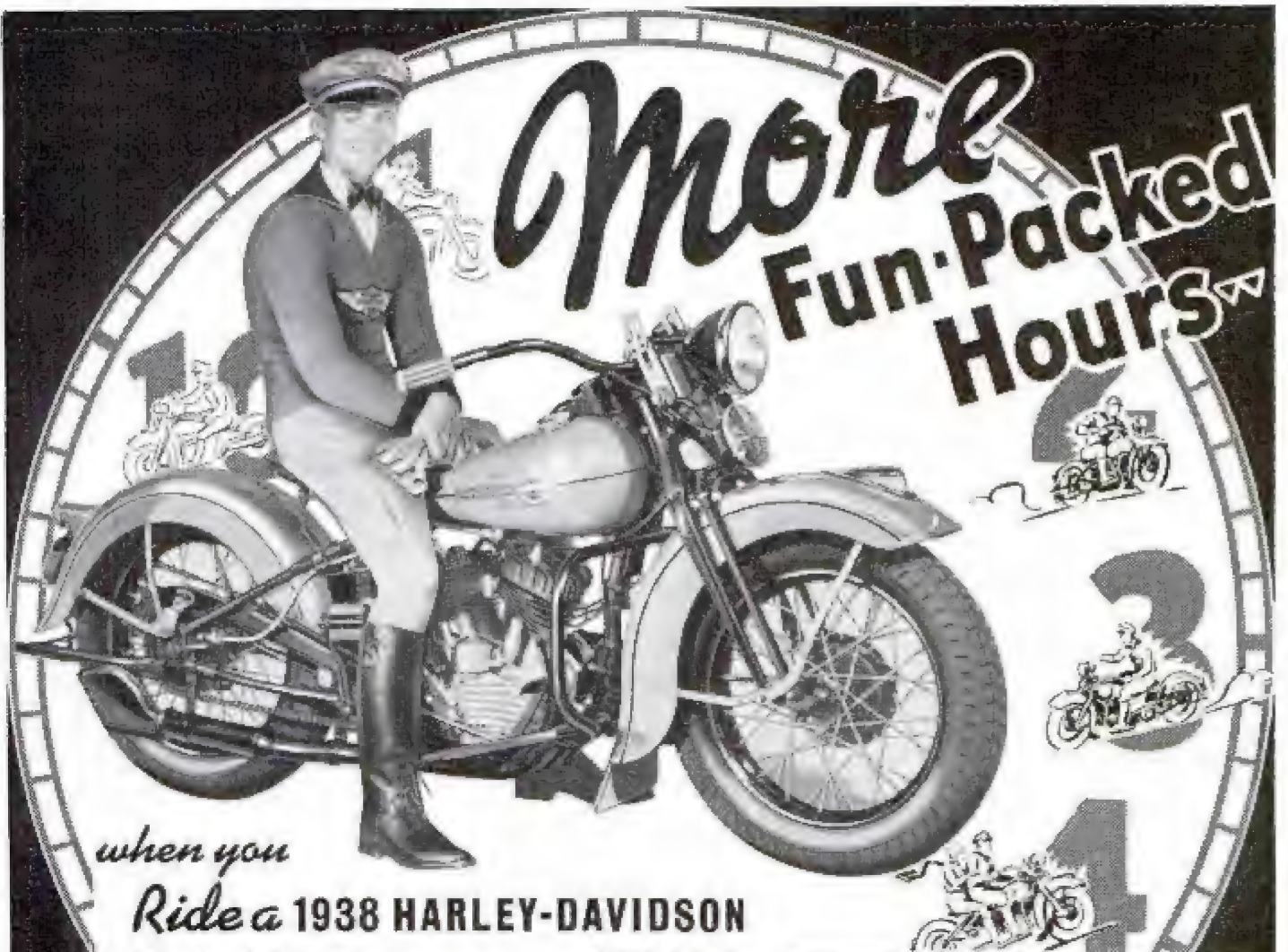
Table-cabinet game which requires skill to direct a plunger-shot ball into small ninepins by manipulating a flexible lining at one end of the cabinet.

SKATING ALONG WITH THE WIND

Two types of lightweight sails that you've wished for on those blustery days when ice skating. Sails are made of inexpensive materials available anywhere.

YULETIDE SHADOW BOX

Plywood cutouts mounted on slow-moving belt are silhouetted against indirectly lighted background to create typical desert scene. Operated by motor.



More Fun-Packed Hours

when you
Ride a 1938 HARLEY-DAVIDSON

That's right! The snappy new 1938 Models are always "rarin' to go." And with one of these Harley-Davidsons you sure can pack every spare hour with pleasure—afternoons, evenings, holidays and vacations. So decide now that you're going to OWN a Harley-Davidson. . . The new 1938 Models have the power, zip and stamina to "go places" with real class. New streamlined style and advanced mechanical features make them "tops" in performance and ride value—with new "lows" in mileage cost.

See your nearest Harley-Davidson dealer NOW for a FREE RIDE—ask about his Easy Pay Plans — and send in the coupon!



Harley-Davidson wins all four 1937 National Hillclimb Championships at Muskegon, Michigan. Above: Hap Seaman, 45 and 80 Class "B" National Champion — Harley-Davidson mounted.

HARLEY-DAVIDSON

HARLEY-DAVIDSON MOTOR CO.,
Dept. P. Milwaukee, Wis.

Interested in motorcycling. Send illustrated literature. Postage stamp is enclosed to cover mailing cost.

Name _____

Address _____

My age is ☐ 16-19 years. ☐ 20-30 years.
☐ 31 years and up. ☐ 16 years.
Check your age group.

A NATURAL QUESTION :

Do people get more pleasure out of Camel's Costlier Tobaccos?



OUTDOOR GIRL (above). "Camels appeal to me for the reasons they appeal to champions," says Henrietta Donahue. "I smoke often and Camels don't upset my nerves."

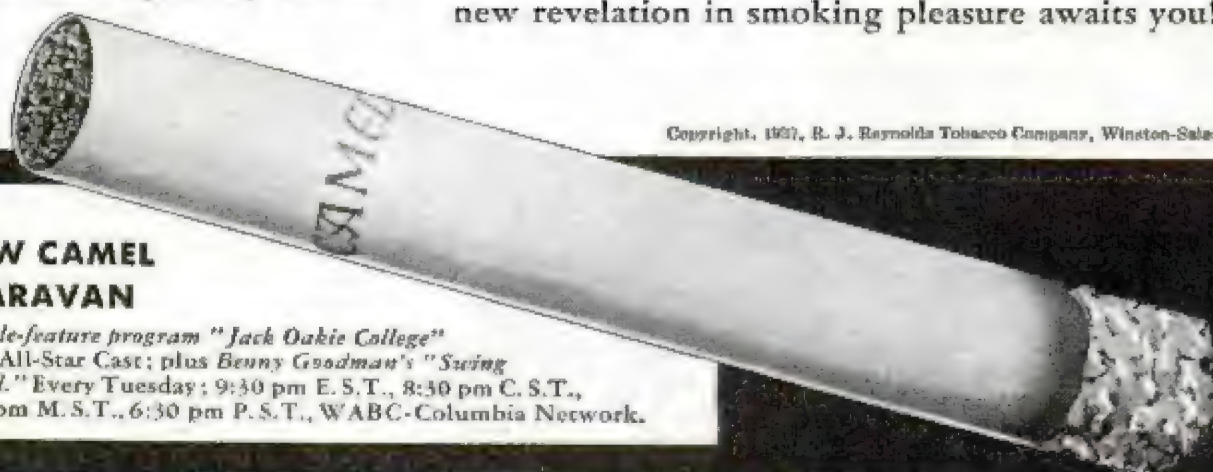
Millions of smokers have found greater enjoyment in Camels

SMOKERS have learned that "finer tobaccos" and "Camel cigarettes" go together. For it is a well-known fact that Camel spends millions more to obtain choicer tobaccos. And what a difference these costlier tobaccos make! Men and women in all walks of life find that Camels give them greater enjoyment — that Camels don't irritate the throat or tire the taste. Perhaps you know this from your own experience. If not, a new revelation in smoking pleasure awaits you!

Copyright, 1937, R. J. Reynolds Tobacco Company, Winston-Salem, N. C.

NEW CAMEL CARAVAN

Double-feature program "Jack Oakie College" with All-Star Cast; plus Benny Goodman's "Swing School." Every Tuesday; 9:30 pm E. S. T., 8:30 pm C. S. T., 7:30 pm M. S. T., 6:30 pm P. S. T., WABC-Columbia Network.



THE STRAIGHTFORWARD ANSWER:

Camels are the Largest-Selling cigarette in America

STENOGRAPHER (*below*). Miss Claire Huntington often rushes through lunch. "I smoke Camels," she says. "They add cheer to my meals. And Camels don't leave that 'cigaretry' after-taste."



SKIING EXPERT (*above*). Mile-a-minute skiing is nothing unusual to Sig Buchmayr. "But it takes healthy nerves," he says. "I discovered, long ago, that Camels don't upset my nerves. That means a lot because I smoke a lot."

COW-PUNCHER (*below*). Hardy Murphy says: "Ridin' herd day in and day out wears a man down. And that's one of the many times a Camel sure hits the spot. I get a 'lift' with a Camel."

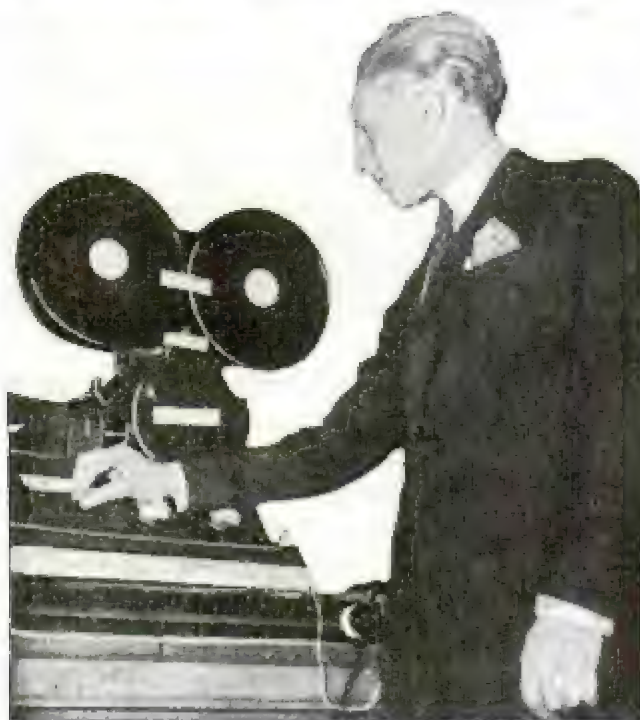


Camels are a matchless blend
of finer, **MORE EXPENSIVE TOBACCOS**
Turkish and Domestic

Latest in Music

(Continued from page 831)

Each pair of these seven sets of microphones were so placed that they picked up that special section of the orchestra fully, with the rest of the orchestra sound as a background. Then from each pair of microphones went leads to recording machines. From one microphone of the pair, a lead went to a machine recording on a separate channel, and from the other microphone, a lead went to a mixing panel. Thus there were seven separate channels, and an eighth channel which was a mixture of these seven. The mixing panel



Special sound recording device which puts sound on film with aid of ultraviolet light

made it possible to "mix" these seven channels in any way desired.

There also was a general pick-up from a battery of microphones placed above the orchestra. This was recorded on a separate channel, making nine in all.

Other musicians were used in Hollywood to make the action part of the film. Then with these action films before him, and the nine channels of sound, Dr. Stokowski was able to add whatever musical and sound effects he desired.

In this way, for the first time, a musical director had at his service music in various shades and colors much as an artist has colors on a palette, and was able to mix this music to produce effects which no orchestra could produce without the engineer's aid.

Focusing Your Camera

(Continued from page 890)

tive film with artificial light. And the reflector is important, for a good reflector behind your floodlamp increases its effectiveness by as much as seven times. You can rig up a makeshift reflector yourself; you can buy an excellent metal one, or you can buy a very efficient yet inexpensive cardboard reflector at a camera store. In using any artificial light, remember that its intensity diminishes rapidly as you move it away from your subject. Keep the light as close to the subject as practicable.

Photoflash lamps operate on any current from that of a pocket flashlight battery to standard house current, and they produce a brilliant flash of highly actinic light. Simply set the camera for time or bulb, and when ready open the shutter, set off the Photoflash and close the shutter.

With a supply of fast film, a camera, lights for indoor snapshots and a good store of ideas in your head, you are equipped for almost anything. You may want to use a tripod for time and bulb exposures, and if you attempt extreme closeups you may need an accessory portrait lens, a simple, inexpensive slip-on lens. But keep your equipment as simple as you can; it will be more fun and less work.

During the holidays you may find opportunities for several photographic specialties—silhouettes, tabletop scenes of miniature reindeer pulling Santa Claus over cotton snow, firelight pictures around the hearth, double-exposures, and the like. But they are not so important to the Christmas record; save them for the "long winter evenings."

If you've never made an adequate photographic story of Christmas in your home, try it this year. A few months hence it will be priceless, and you'll want to repeat with a scrapbook story of Christmas, 1938. Don't forget that pictures of everyday and holiday home scenes are more important history to your family than the pictures that appear in today's newspaper.

¶ Popular Mechanics Magazine does not publish the name of the maker of, or dealer in, any device described in its pages, but this information will be furnished by our Bureau of Information upon request, accompanied by stamped envelope.

America's fastest growing hobby

SNAPSHOTS at NIGHT



Just do this

1. Load your camera with Kodak "SS" Film
2. Use two or three Photoflood lamps in Kodak Handy Reflectors



FREE BOOKLET...

Suggests a variety of picture opportunities... shows you how to arrange your lights... how to place your subject... tells you everything you need to know about two ways to make night pictures—snapshots with Photoflood lamps, *fast exposures* with Photoflash lamps. (You can use Photoflash lamps, each good for one picture, if your camera can be set for "time.")

Get a copy at your dealer's... Eastman Kodak Company, Rochester, N. Y.

THERE'S FUN for the whole family in snapshots at night. Baby in his bath... the older children with their pets... grown-ups at the piano... everybody enjoys the "shooting." And you, most of all—for you're snapping those intimate family pictures you've always wanted, never hoped to get.

You don't need an expensive camera for snapshots indoors at

night—not any more. Any camera that can be loaded with Kodak "SS" Film will do the trick—even the simplest Brownie.

With "SS" Film, you use two or three of the new No. 2 Mazda Photoflood lamps, which last for hours, in the inexpensive Kodak Handy Reflectors. If your camera has an *f.6.3* or faster lens, then No. 1 Photoflood lamps are powerful enough.



Snow—a Billion Dollar Business

(Continued from page 869)

resorts facilities have been laid out for other forms of sport less vigorous than skiing. Sleigh roads and snowshoe trails have been made and scenic splendors are stressed for amateur photographers. Dog-teaming attracts many visitors. In the National Parks there is a sport called "ash-canning," which consists of sitting in an ash-can cover and sliding down slopes while the cover spins.

Contrary to popular ideas, skiing is not an art of jumping. Only one skier in ten makes a practice of jumping and in Yosemite's Badger Pass it was found that the man-made ski jump was so little used that park officials dismantled it to make room for additional ski runs. Instructors report that anyone can learn to ski competently in three seasons. The beginner finds that

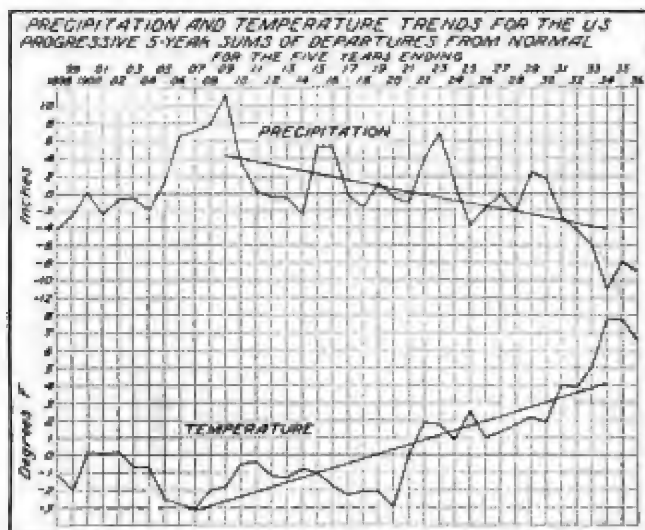
he continues to follow the sport the skier adds to his outfit a lightweight parka or jacket, goggles, ski waxes, headlamp for night skiing, and a triangular pack sack to carry on his back. Skiers spent over \$400,000 in Seattle, Wash., stores alone during November and December of 1936.

By auto or train the ski enthusiast will go to as many resorts as his purse can afford. In Yosemite he goes to the hotel and spends fifteen dollars per day or to the lodge which costs only five dollars per day. If stops are made outside the park, his expenses may be lower.

On the other side of the picture, snow is still the old-fashioned snow, the snow that means lots of work and expense. Highways and city streets have to be cleared. Reports to the government show an annual cost of over \$11,000,000 for clearing federal state highways and about twice that amount for county road systems. Snow removal in cities is costly because the snow has to be hauled to sewer mains or city outskirts and mostly involves hand labor; \$150,000,000 is regarded as a conservative estimate.

Railroads charge off \$13,000,000 as snow and ice removal costs. In the severe storms in the West during 1936, the Northern Pacific railway spent over \$300,000, and other western roads comparable amounts. Rock Island reported that "the aid of radio stations was enlisted and calls were put out over the air asking that any men who had warm clothing and wanted to work, report to the railroad and they would be given jobs shoveling out the line." As a result they spent over \$100,000 to free snow-bound trains and to clear their line.


With all of this money directly associated with the winter snows, many people are asking "Is our climate changing?" The United States weather bureau says it is not, and explains that climate is the weather average over long periods of time, 100 years or more, while weather refers to conditions for a day, a week, or even a year. However, weather records show higher temperatures and less precipitation since 1910. Sports enthusiasts need not worry about a lack of snow, even in face of this trend to mildness, because the winter resorts are in mountainous regions at high altitudes where snow is plentiful.



Showing how precipitation has dropped while average temperature has climbed

the most important item for enjoyment of this sport is the binding which holds his feet to the skis. A regular ski boot is almost a necessity because the heavy arch will stand the strain of continual bending. A binding on the ski which will permit no sideplay of the foot but only an up-and-down movement prevents discomfort. Skiers find that their clothing must be lightweight, to permit free movement of the body, warm and resistant to dampness.

Usually the skier goes from the period of rented skis, khaki breeches, and high-top boots, to the stage of owning a complete outfit. Gabardine ski pants and jacket, cap, boots, skis, poles, etc., can be bought for thirty or thirty-five dollars, but better grades cost sixty-five dollars and up. As



Put a
ring
around
this

*it's better
smoking
tobacco*

...and here's
why

- aged-in-wood
Burley tobacco
- extra good taste
- for pipe or
cigarette

*2 full ounces
in every tin*



Railroading for Men Only

(Continued from page 885)

right of way. And that is where rival clubs exercise their ingenuity. Alongside the Milwaukee Union Terminal tracks are plaster highways with tiny automobiles waiting at grade crossings. Miniature rail



Terminal yardmaster operating switches and yard controls, with six trains waiting for orders

fences guard the right of way; tenuous copper wire stretches from one slender telephone pole to the next. Trees and shrubbery are bits of synthetic greenery from a florist's shop, or occasionally real twigs and leaves and moss shellacked or sprayed for permanence. An amateur artist painted scenery around the walls and simulated a mountain around the tunnels that lead into the back room. Roofing paper with a gravelly surface is used for ballast. Wire mesh forms the contours of the countryside; it is covered with paperboard and plaster.

The river that runs under the steel bridge on the Terminal line is made of water glass. A big model railway in Maywood, Ill., approaches even closer to nature with a real waterfall that tumbles down a rocky mountainside that slopes almost to the ceiling. In Maywood, too, there is a wide lake with a train ferry that noses up to a railway dock, lets a train roll aboard, and then under power of its twin side paddles, operated by two remotely controlled electric motors, it glides across the lake to a river mouth, guides itself—by cutting out one or the other sidewheel—under a motor-operated railway lift bridge and up a river to another railway dock to discharge the train. Cables dragged in the water under the ferry carry power from

the remote-control switches. Spanning the freight yards beside the lake is a big gantry crane built by the consulting engineer who spends most of his time at his hobby. As he manipulates remote switches the crane travels to a coal pile, drops its bucket and picks up a load, rises and moves over to the dock to drop the coal into a barge.

It is almost sacrilege to touch a locomotive on these railroads for truant business men. However much you'd like to fondle the engines and cars you must leave them very much alone. They are to be operated entirely by electric controls. Even the cars are built with automatic couplers that lock when shunted together. If you do pick up a model engine when the dispatcher isn't looking you'll find it astonishingly heavy; most of these miniature locomotives weigh around fifteen pounds.

You need not be a mechanical genius to find a place on the staff of a model railway. If you know the trick of sandpapering celluloid windows for passenger cars, or making "earth" for the farms along the railroad out of coffee grounds or flour, water and salt; or if you can make over a clock face to tell "scale time" and write a

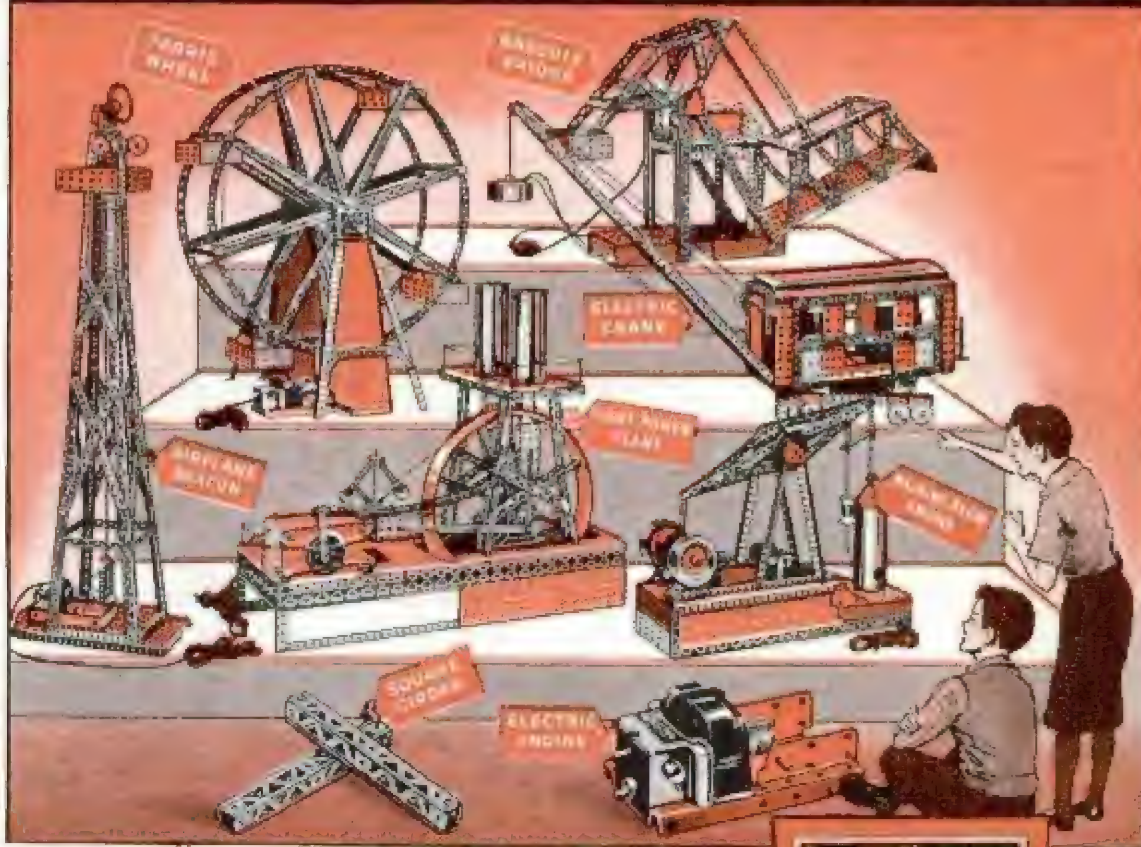


Repair work on aluminum-painted caboose, modeled after latest type with bay window instead of cupola

timetable for a miniature system, there's a job waiting for you. The section gang always needs men, for a model railway is never finished.

admission to the club on Fifth Avenue
501 N. Third St. Maywood, Ill.
Suburban Model Club
22 N. Sixth Ave.

THE GILBERT HALL OF SCIENCE PRESENTS

*The great
New Speed***ERECTOR**

MORE
THAN 100
MECHANICAL
MARVELS

500
HOURS OF
THRILLING
FUN

OVER
15 LBS. OF
ENGINEERING
PARTS

ALL
PACKED
IN ONE
ERECTOR SET

BOYS! You step into a dazzling new world when you own the great new Speed Erector. With your own hands you can make dozens of mighty mechanical marvels that hum with action. Hook up the powerful Erector electric engine and that Bascule bridge actually opens and closes. The ferris wheel goes 'round and 'round. The airplane beacon revolves. The magnetic crane raises and lowers—swings to the right or left—grabs up steel girders before it touches them. There are more thrills—more hours of fun—in an Erector Set than anything else you can own. Tell Dad the great new Speed Erector is what you want most for Christmas.



• It's a humdinger, boys, this new No. 8½ Erector Set. The greatest development of the famous Gilbert Hall of Science. Contains over 15 lbs. of parts. Red, yellow and blue girders and structural plates. Glistening boiler shells. Big red wheels. A powerful 110 volt electric engine that reverses. Gears, pinions and other parts for building more than 100 giant, realistic engineering marvels. Its price is \$12.95, and there are other Erector Sets from \$1.00 to \$27.50.

FREE "How-to-Sell-Dad" Poster and "Gimme Card"

7 sq. ft. "How-to-Sell-Dad" Poster. Shows new Speed Erector in life size and full colors. Also, "Gimme" card to help you get what you want for Christmas. Send coupon or 1¢ post card.

A. C. GILBERT CO.

16 Erector Square

New Haven, Conn.

Quick! Send me your colossal "How-to-Sell-Dad" Poster and "Gimme" card—both Free.

Name

Street

City State.....

The Awakening of the Ghost Towns

(Continued from page 837)

furniture and equipment. Recently, while prowling through the gold country, he discovered an early fire engine complete to leather buckets and hose. When he took it apart to clean it he made a startling discovery. In the base of the pump, caught behind a metal projecting lip, was twenty-five dollars worth of gold dust. The fire engine had caught and saved the fine gold suspended in the water pumped through it while fighting fires in the early days.

Besides the increased price of gold that makes mining more profitable today, la-

Not all of the gold towns, of course, were ever completely abandoned. Some have been busy for fifty or sixty years because their mines have never been worked out. Near Grass Valley in California one vein has been followed for 9,000 feet and the ore is still as good as ever. At another mine high in the hills the miners live on the surface 2,500 feet above sea level and are carried 1,500 feet below sea level every morning by elevators to work at the bottom of the shaft. Places such as Angels Camp and Sonora on the Mother Lode became sleepy settlements when the first mining excitement subsided. Now they are booming again.

Some of the ghost towns have come back to life before. In the last century Cerro Gordo in the mountains above Owens Lake in California produced \$17,000,000 worth of silver before it was abandoned. The mines also produced a lot of gold but no one had bothered to assay the ore for gold so it was thrown on the dump. There some smart Mexican laborers found it and claimed it. The silver ore alone was so rich that between freighting trips the bars of metal were stacked up outside the mill like cordwood. Although the Cerro Gordo ore also contained zinc and lead the town was deserted when the silver values began to fall. In 1911 the demand for zinc became active and for a time the early ghost town was active again. Now, with silver, lead, and zinc all on the upgrade, prospectors and leasers are moving back into the district and Cerro Gordo is returning to life for the third time.

There is still plenty of gold in the west for those who can get it. The famous San Juan Ridge in California contains more than \$400,000,000 in gold dust and nuggets but the trouble is that it can be removed profitably only by hydraulic mining, and the trouble with hydraulic mining is that its debris overflows and buries good farm land. It was forbidden long ago. In the old days one hydraulic company built 200 miles of ditches and flumes to gather the water it needed, and another company made money working 41,000,000 cubic yards of dirt that contained only ten cents worth of gold per yard. The powerful

(Continued to page 124A)



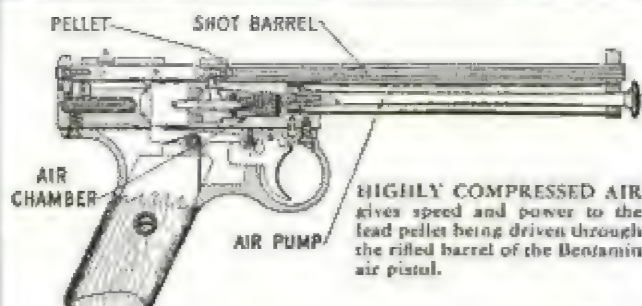
Roulette wheel found in good condition in an abandoned ghost town

bor-saving short cuts and modern equipment in the mines and mills are enabling mines to make profit where none could be made before. Some rich mines that were abandoned when the lower levels were flooded by flows of water are being worked again because modern pumps are able to keep the shafts dry. Although every house is occupied again in many of the gold towns, some of the old silver camps are still asleep. The price of silver is still too low to pay for working some of the low-grade mines at a profit.

COMPRESSED AIR FIRES BULLET

IN NEW TARGET PISTOL

The lower "barrel" of this highly accurate pistol is really an air pump. Air is pumped into a "compression chamber" where it is held until the trigger mechanism releases it into the barrel to drive a lead pellet. Enough force can be "pumped up" to pierce a tin can easily.

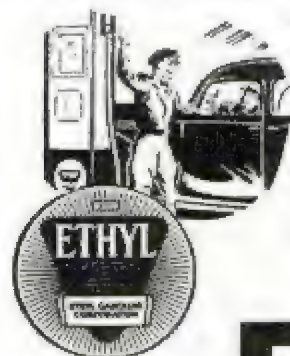
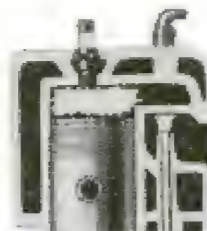


Practice arm demonstrates HIGH COMPRESSION principle of modern auto engine

THE greater the air pressure back of the air-gun's pellet, the further and harder it will shoot. The higher the compression in the cylinders of your motor car, the more power you get.

It's as simple as that. And that's why automobile manufacturers are using high compression engines in even the lowest priced cars. These cars squeeze more power, more mileage, more get-away from every drop of gasoline.

HIGHLY COMPRESSED GAS mixture in the cylinders of your automobile engine gives extra power, more mileage, and that added responsiveness so important in emergencies. Only Ethyl permits you to get the full benefit of this compression—lets your car dealer advance the spark for maximum performance.



Look for this emblem on the base or globe of every Ethyl pump. It means best-grade gasoline.

GIVES YOU A BETTER RUN FOR YOUR MONEY

To get these advantages go to your car dealer and have him set the spark for maximum performance and then use a fuel made for high compression! Stop at the "Ethyl" pump. There you get more anti-knock fluid (containing lead tetraethyl) than you get in the best regular-grade gasoline. By preventing harmful knock you make sure of 100% performance from your high compression engine.

And remember—at these Ethyl pumps you get all-round quality that is double-tested—by the oil company and by the Ethyl laboratories.

ETHYL GETS FULL POWER FROM HIGH COMPRESSION

When writing advertisers please mention Popular Mechanics

(Continued from page 122A)

streams of water tore a pit 550 feet deep and one and one-eighth of a mile long through a hill. Modified hydraulicking is going to be permitted again when dams to catch the water and debris and prevent their spread are constructed.

Huge gold dredges that scoop up tons of sand and gravel per hour can also make money on material that contains only a few cents worth of gold per cubic yard and many of these dredges are active in Alaska and California. New deposits of placer gold never worked before are being tested with dry land dredges that are not boats at all and that need only limited amounts of water for washing the gold out of the sand.



Ruins of stamp mill for crushing ore. All the heavy parts were freighted long distances

In hard rock mining the ore is ground down to dust under the blows of heavy metal stamp hammers. Then the gold is removed by shaking the metal out of the material, by flowing the ore over amalgamation tables coated with mercury that catches the gold, or by mixing the material in a tank with a cyanide solution that dissolves out the gold and silver. Still another way of milling is the flotation method by which oil and chemicals coat the particles of gold so that they float to the surface. One of these methods or a combination of them, depending upon the exact kind of ore that a mine contains, is able to extract as much as ninety-eight per cent of the gold. This is a much higher percentage than was possible a few decades ago and large quantities of new gold today

are being extracted from the discarded dumps of early mines.

The boom in gold mining is indicated by the fact that last year California produced \$36,700,000 worth of the yellow metal as against a production of only \$8,500,000 worth in 1929. A good part of this increase, of course, reflects the present thirty-five dollars per ounce price of gold. About eighty per cent of the increased production comes from the re-opening of mines that had been shut down or that couldn't operate profitably at the former lower price of gold. The balance of the increase in production comes from new ore bodies and deposits discovered by "depression miners."

In all, twenty-one states mined gold commercially last year. California still produces more gold than any other state and last year produced twice as much as Alaska. The Philippines and South Dakota, with more than \$20,000,000 worth of gold each, ranked next under California, which since the days of '49 has produced a total of nearly \$2,000,000,000 worth of gold. More than \$160,000,000 worth of gold will be mined in the United States this year, the greatest monetary record so far, although not a record in ounce production.

In the next few years, mining engineers believe, gold production will zoom to even higher totals. They expect that the present assessment moratorium law, which in the last few years has excused many holders of mining claims from the required \$100 worth of work per claim per year, will soon be withdrawn. When these thousands of idle claims are worked again, they think, additional ore bodies will be developed, more new discoveries made, and production stepped up.

2-10-31

Auto Radiator Sealed by Valve to Save Anti-Freeze

To keep alcohol or other anti-freeze from evaporating, a valve has been developed which seals the cooling system of the automobile. It is fitted to the bottom of the radiator overflow pipe and opens only under pressure, letting the steam escape if the engine overheats. With this valve in operation one filling of anti-freeze should last all winter.

*Evans Products Co.
24 Madison Ave. N.Y.C.*



MOBIL OIL ARCTIC makes all cars
start Easy..run Sweet..in Frigid Weather

CHANGE

TODAY



WINTER-PROOF TODAY

START QUICK with Mobiloil Arctic. **SHIFT EASY** on coldest days with Mobiloil Gear Oil. **RIDE QUIET**—Special Winter Mobilgreases end squeaks. **END FREEZE-UPS** with Mobil Freeze-one—new radiator anti-freeze.

**"BETTER ONE WEEK EARLY—
THAN ONE DAY LATE!"**

THE PICTURE above is a warning to you! Cold snaps come suddenly...it pays to have your engine ready with Mobiloil Arctic!

Mobiloil Arctic is absolutely the finest winter oil for quick starting. It flows freely in a split second, yet protects your engine fully when it's running hot!

That's what you want this winter, isn't it? ...quick starts—and a safe engine. Stop today and change to Mobiloil Arctic.

MOBIL OIL AND MOBIL GAS

SOCONY-VACUUM OIL COMPANY, INC.



2210 36



New Remington NOISELESS PORTABLE

Now you can own a brand new, latest model Remington de luxe Noiseless Portable for only 10¢ a day. This amazing typewriter has all the modern features of the big office machines. Standard keyboard, handset tabulator, composition keys, automatic ribbon reverse, two color ribbon shift, etc., PLUS the NOISELESS ACTION that types in a hushed whisper!

ONLY
10¢
A DAY!

ENJOY 10 FULL DAYS TRIAL...FREE

Try this great new Remington in your own home for 10 days. Use it as much as you like. See how convenient it is to type letters, memos, reports; how much pleasure you get from putting your spare time to profitable use. Earn extra money—develop your ideas—enter contests. You can write better—think better—spell better when you use your Remington. If you're not 100% delighted, return it AT OUR EXPENSE at the end of ten days. We pay transportation charges BOTH WAYS.

EXTRA!

HERE'S WHAT
YOU GET
FREE!

1. Typewriter Course. Anyone can learn to typewrite with this FREE 19 page course.
2. 10-DAY FREE TRIAL in your own home. Convince yourself without risking a cent.

HURRY! RUSH COUPON FOR "FACTORY" OFFER

Write for big Free illustrated catalog describing all of the famous Portable models; special 10¢ a day plan; 10-day free trial offer, free typing course that makes it easy for anyone to typewrite, and Double Duty Carrying Case that can be used as an overnight bag. Don't send any money—just mail coupon and get all the facts WITHOUT OBLIGATION.

REMINGTON RAND INC.
Dept. 152-12 Buffalo, N. Y.

REMINGTON RAND INC., Dept. 152-12
Buffalo, N. Y.

Rush FREE Catalog and full information about the "10¢ a day" plan, Free Trial Offer, Free typing course, etc., entirely without obligation. This is not an order.

Name.....

Address.....

Town.....State.....

When writing please mention Popular Mechanics

Inventing Circus Laughs

(Continued from page 845)

the clown's waist. The completed prop weighed sixteen pounds and circus crowds of nearly every state of the Union have howled with delight to see Hershey, dressed in baby's clothing, with a rattle in one hand and a milk bottle in the other, legs covered from the hips down by a drape, parade about the arena with this "Baby Zep" balloon which appears to be supporting the "baby."

Hershey also wanted a Chinese laundry prop. Aronson promptly turned it out. In this one, the clown wore a Chinese mask and headpiece consisting of a "pigtail," or rigid steel rod, sticking out two feet behind. Dressed in blue Chinese pajama suit, with an ironing board strapped in front of him, and a washing consisting of infants' clothing hanging from the pigtail, he walked about the arena vigorously pushing a dummy iron over the board, and the customers all but rolled in the aisles.

With these two props and a few simpler ones, Hershey went on the road, traveling 21,000 miles in thirty weeks. At the end of the season, back he came to regale Aronson with more yarns of circus life. The couple ate clown, dreamed clown, slept clown. When winter set in, Aronson asked about new props for the coming season.

"The 'Baby Zep' and Chinese laundry gags were swell," said Hershey, "but I got a better one."

"What do you want now?" demanded Aronson suspiciously.

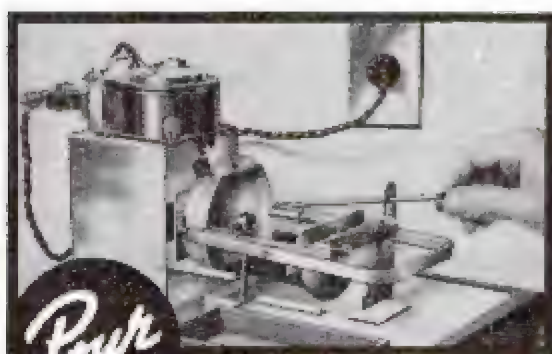
"A goose," declared the clown firmly. "A goose that looks like a goose to chase me around the track. I will be hollering and carrying a little ax, pantomiming that I started out to kill the goose and he got me by the seat of the pants. It was done years ago by one clown with a live goose, but even if I could train a live goose to do the stunt, my act would be ruined if the goose happened to die. So I want a stuffed bird that looks like a real one. Feathers and all."

Aronson scratched his head. He had a tool shop, but you couldn't turn out a goose on a lathe—at least, not the kind the clown wanted. The prop man thought any goose would do as a model. Then he found he was mistaken. The goose must be in a fighting, attacking attitude, crouching,

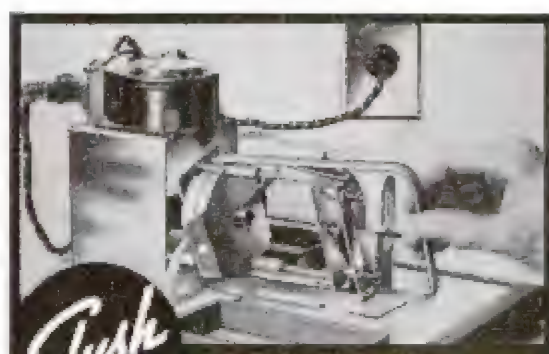
(Continued to page 128A)

NEW GILBERT ELECTRIC KASTER KIT

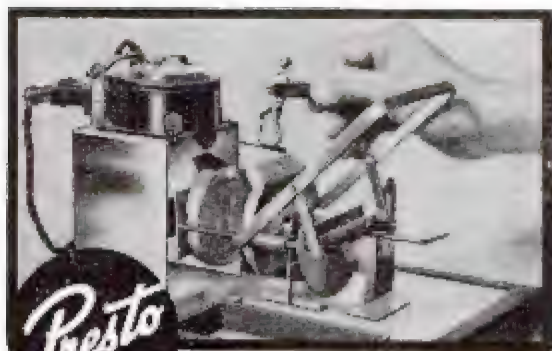
First and only "slush type" Casting Outfit—makes life-like figures with fifty percent less metal



Lift the lever and molten metal flows into the mold. Developed by the Gilbert Hall of Science, Kaster Kit is automatic. Heats electrically. Safest, easiest, fastest casting outfit you can own.



A twist of the "metal-saver" lever slushes off excess metal—producing a hollow casting. This revolutionary improvement makes possible fifty percent more figures from the same amount of metal.



Out pops your soldier—"true mold"—correct proportions—not flat and thin like the ordinary kind. Color soldiers to resemble all the armies of the world.

• • •

See the new No. 7 Kaster Kit at your nearest toy store. Complete with 1 mold, 24 pigs of metal, tools and 2 paints, \$6.50. Other Gilbert casting outfits from \$1.00.

FREE The Big Kaster Kit Parade—in full colors—shows all 32 Kaster Kit Molds that make realistic soldiers for you.



32 Different Molds

Soldiers, sailors, Indians, athletes—these are but a few of the 32 Kaster Kit molds you can get. Set of 4 bandmen, 4 athletes, or 4 military figures, \$2.00 per set.

The A. C. Gilbert Company
110 Erector Square, New Haven, Conn.
Please send me your Kaster Kit Parade—free

Name.....

Street.....

City.....State.....

Inventing Circus Laughs

(Continued from page 126A)

neck out, wings lowered to the ground. He resorted to pictures for the right pose and looked at forty-seven before he found one two inches square which showed the attitude he wanted. He stepped it up to sixteen times its size, thus showing a goose which, if alive, would weigh fifteen to eighteen pounds.

He took a cardboard pattern of his enlarged goose and traced it on the workbench. Over this he bent in wire the outline of the bird, tacking it down while bending it. Temporary wires were soldered

goose began to assume the shape and proportions of a live bird.

Heavy linen cord was woven between the wire meshes and two separate covers of heavy muslin with light padding were sewed on by hand. Eyes were made from metal, bill and legs were covered with orange print, the feet were fashioned from an old inner tube. Then came the job of feathering. Enough feathers were obtained to cover a flock of geese but how to attach them?

Strips of muslin three inches wide were cut and feather after feather was sewed on by machine. Then the machine was run over the quills four or five times and this virtually matted them in, allowing the plumes to extend over the cloth strip. Twelve yards of these feathered strips were made, then, starting with the tail, the strips were sewed to the covering of the goose, this being done by hand, each strip overlapping the next like a shingle roof. That finished the goose. Its weight was seven pounds and it measured just thirty-three inches from bill to tip of tail. More than 400 feet of different gauge wire had been employed and more than 500 solder joints were required to hold it in place.

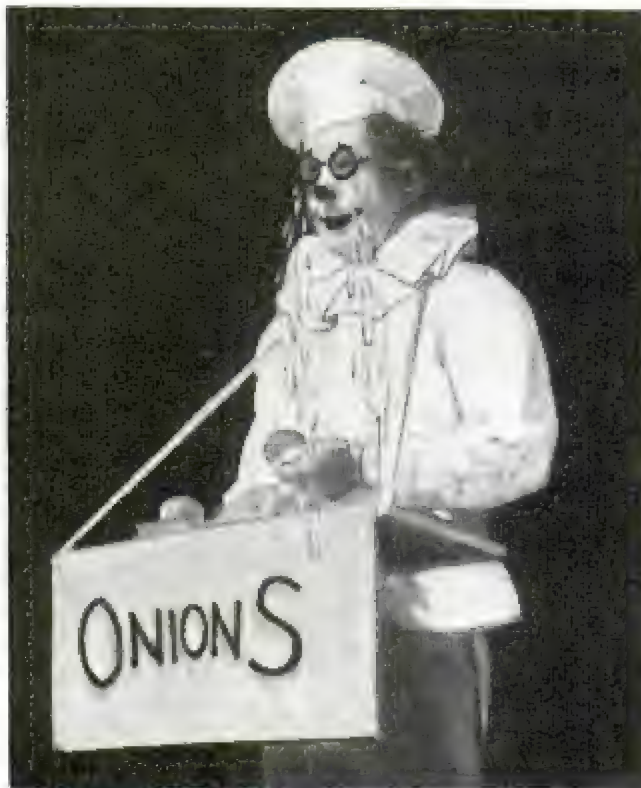
Now came the problem of attaching the goose to the clown. It must be suspended in midair, wings flapping, so a harness had to be devised to support it. A canvas harness was made and to the vertical piece running along the back, a length of strap iron was riveted after the iron first had been heated and bent to conform to the clown's body. Welded to the iron was a quarter-inch malleable rod with a pipe nipple welded to its end. The nipple at the end of this rod screwed into the coupling in the goose's mouth.

"It is a shame," says Mr. Aronson, "that the crowds can't see the harness some of the clowns wear to support the props! Often the hidden harness is more intricate than the visible contrivance."

While they were at work on the goose, Hershey happened to see in a store window a miniature head used to advertise collars. Immediately he had a new idea, a gag to be dubbed "What a Man!"

"Instead of the usual oversize head and

(Continued to page 130A)



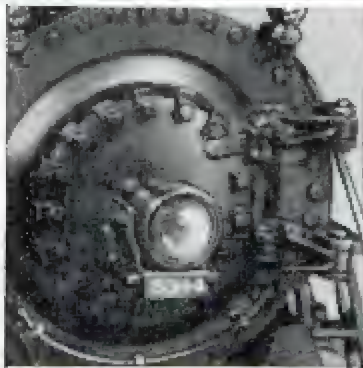
Here is another side-splitter, the onion gag. Note the clown's copious tears

across to prevent springing, then the tacks were removed and the outline in wire was ready. Rings bent from wire to represent head, neck and body were soldered into place. Lateral and cross wires were run, each being tied and soldered. When the wire work was finished, the neck was severed from the body. In the body was anchored a pipe and through the neck was run another piece of pipe which emerged from the mouth. This arrangement allowed head and neck to be detached from the body by unscrewing one pipe from the other, thus saving space in packing. Detachable wings were made of wire and the



*Start a
Railroad Empire
with this...*

LIONEL SCALE MODEL



Headlight is projected in parallel beams through optical lens. Lamp is concealed inside the smoke box.



Retractable pilot coupler shown in service position. Pin lifting crank is fitted with a tiny link chain.



Complete actuated Baker valve gear. Crosshead guides are stainless steel. Crosshead and rods are cast for detail perfection and plated.

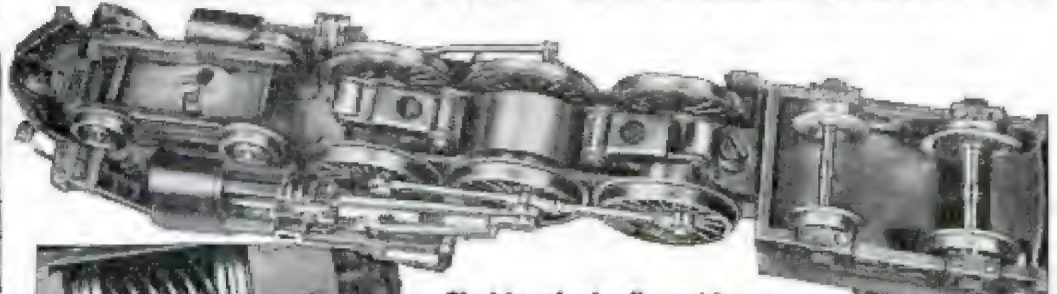
AUTHENTIC DIE CAST, WORM GEARED REPLICA OF THE MIGHTY HUDSON TYPE 5344-J1E

You men with a natural gift for things scientific... what in all this golden age of mechanical ingenuity can add up so many thrills as building a miniature railroad system all your own?

Particularly this year! For here at last is Lionel with a scale model, the crowning achievement of its 37 years of train building... an exact "O" Gauge replica of the New York Central's latest Hudson, the first authentic model of its kind.

Now at last the thrills of scale model railroading are within the reach of every man, for the vast resources of Lionel have made it possible to produce this model of models at \$75... finished, ready to run. But there's not room here to tell you the whole exciting story so clip out and mail the coupon below for a copy of the 16-page Lionel scale model booklet.

THE LIONEL CORPORATION
15 EAST 26TH STREET, NEW YORK



Six drive wheels, die cast to precision finer than a human hair, are fitted with seamless steel tires. Both outside and inside third rail shoes are provided, for operation on any "O" Gauge track having curves of at least three foot radius.



Equipped with ball bearings for the thrust, and worm gear so constructed that it is not self-locking.



Faithful to the finest details, the wheels are held by bearing caps that are bolted with hexagonal head bolts.



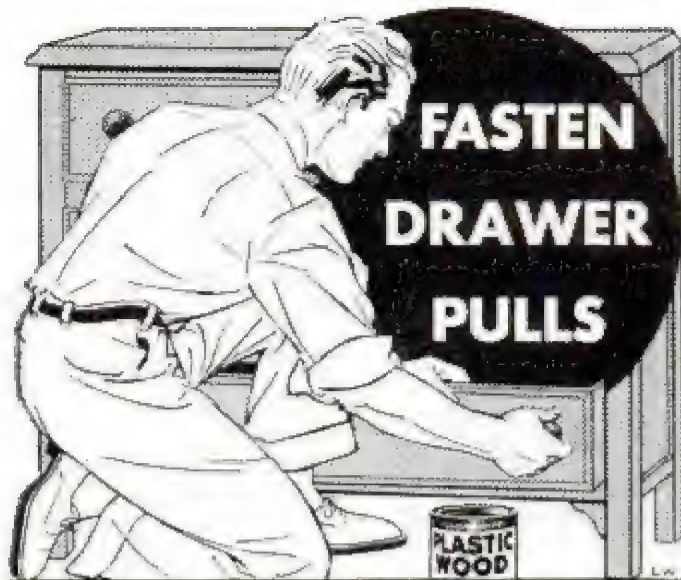
THE LIONEL CORPORATION
15 East 26th St., Dept. No. 109
New York, N. Y.

Enclosed is ten cents for a copy of the new Lionel 16-page scale model locomotive booklet.

Name _____ Please Print

Address _____

City _____ State _____



Wood in Cans Makes 1001 Repairs

There's nothing like genuine Plastic Wood for making quick, yet permanent repairs—resetting loose drawer pulls, casters, bathroom fixtures, filling old screw holes, cracks in floors, baseboards, shelving, etc. It handles easily as putty and quickly hardens into lasting wood that adheres to wood, metal, glass, plaster—wood that holds nails and screws and can be finished just like real wood. Sold at hardware, paint, and 10¢ stores—in cans and tubes.



PLASTIC WOOD

FIX IT

**ONCE AND FOR ALL
WITH NEW CEMENT**

Quickly, permanently joins and repairs china, glass, wood, celluloid, etc.—Transparent, yet sets like granite.

Also available in Metal Cement in large or small tubes. At paint, hardware and 10¢ stores.



Old English CEMENTS

**FOR
MODERN
SHAVING**

Barbasol

**NO BRUSH
NO LATHER
NO RUB IN**

**NEW
BENJAMIN AIR PISTOLS**

Powerful - Accurate - Economical - Practical - Adjustable Shooting Force - Amazing Maximum Velocity - cal. 177 Ford and BB - For Target and Small Game - the only Genuine Compressed Air Pistol for Shooting BB on the market - Single Shot with Bolt Action - Hammer Fire - Case Trigger - Safety. Price \$7.50. Heavy \$2.00. Also 177 and 22 Single Shot Air Rifles \$7.50 - Single Shot 115 Air Rifle \$6.00 - 22 Shot BB Repeating Air Rifle \$7.50 - at Dealer or Direct - No license required - Safe for indoor use. FULL DETAILS - TARGETS - FREE - WRITE TODAY Benjamin Air Rifle Co., 831 Marion St., St. Louis, Mo.



251036

Inventing Circus Laughs

(Continued from page 128A)

normal body," he told Aronson, "I want that miniature head and a giant body to go with it."

The prop man built a big wire frame, like a bird cage, to cover the clown's head and shoulders. On top of it was mounted the little head. The frame was padded on the shoulders and a long coat was made to cover the dummy's shoulders and extend down as far as an average coat. The sleeves were padded from the dummy's shoulders down to the clown's shoulders. From there on down, the clown's arms filled the sleeves. A screen opening in the front provided a peek hole for the clown as he walked around the ring carrying the oversize dummy—oversize, at least, except for the miniature head.

"How would it be," Hershey asked one day, "to show me walking around the track comfortably tucked in my own bed? We'll label it 'Retired Clown'."

For this one, Aronson built a bed two and one-half feet wide and five feet long, constructed of bamboo and collapsible. On a canvas cover he sewed a dummy with a big pair of pink feet sticking out from under a counterpane. The clown's head went through an opening at one end of the canvas and lay on a pillow attached to the head of the bed. Into this prop he strapped himself with an invisible harness, and a black drape extending to the ground concealed his feet. Thus the clown walked about the arena, apparently in bed, waving a hand to the crowds. The leverage necessary to support the bed extending five feet in front of the clown was gained by attaching two light but strong bamboo poles to the foot of the bed, the opposite ends resting in pockets in the canvas belt about the clown's waist. Thus both hands and feet were free although the bed weighed fifteen pounds.

The most intricate prop Aronson ever constructed involved fishing. Hershey wanted to come out with a bucket and fish pole and start angling. Then as he pulled up for the catch, he wanted a fish to shoot to the top of the tent and come floating down via parachute to be snared in a net.

Five weeks were required to build the mechanism for this prop, all of it concealed

(Continued to page 136A)

Sweeping the Country!

NEW-TYPE CHEAP OIL BURNER INVENTED!

COOK and HEAT

without COAL or WOOD

In Your Present Stove or Furnace

TWICE THE HEAT AT LESS COST—NO DIRT OR ASHES

QUICK HEAT AT TURN OF VALVE

An Amazing New-Type Oil Burner Which Experts and Users Say BEATS ANY EVER GOTTEN OUT FOR LOW COST, PERFECT PERFORMANCE, Burns Cheap Oil a NEW WAY Without Pre-generating or Clogging Up, Cuts Fuel Bills in Half and Pays for Itself Quickly by What It Saves. READ BELOW HOW YOU CAN TEST THIS REMARKABLE SUPER FLAME OIL BURNER in Your Own Home or Business FREE OF RISK. Then Mail Coupon.

COOKS A MEAL for LESS

Why burn coal or wood with its dirt and drudgery of building and feeding fires? Why carry ashes and get uneven, slow-starting heat, when you can burn cheap oil a NEW WAY and get TWICE THE HEAT at LESS COST—and have QUICK HEAT regulated to any degree desired by a simple turn of a valve?

Your present coal or wood stove, heating stove or furnace can be fitted easily and quickly with our Super Flame "HEAT KING." Thousands have acclaimed it the most perfect oil burner. Nothing like it ever on the market—the lowest priced efficient oil burner—Positively guaranteed NOT TO CLOG, NOT TO CARBON OR STOP UP. The only oil burner that has a record of over 11 years constant use without ever needing any cleaning. Simple—safe—economical—no electrical connections—no moving parts to wear out—all unnecessary parts eliminated—does better work at less cost. Burns 95% air and 5% cheap oil and the result is TWICE THE HEAT OF COAL by simply turning valve. What an Engineer of National Reputation Says:

Combustion principles of the Heat King are simple, efficient, excellent—assures economical

oil consumption and maximum amount of heat. Tests made on burner with one year's hard service prove there was no evidence of dirt or residue within the burner or any carbon deposit on any interior parts. There are no nozzles or tips to "soak up" or stop up with sediment, scale, etc.—G. W. Loveland—K. C. Mo.

WHAT USERS SAY:

There are fifteen oil burners of different kinds here but Heat King is cheapest and best—J. R. Goldthorp—Washington.

I get more heat from your burner than I ever had from coal, wood or anything else I ever burned in my furnace—W. C. Nicholson—Ind.

My wife and her mother say they have reduced their coal bill fifty percent since they put your oil burner in—W. S. Collins, Pa.

Your oil burner is the poor man's friend—L. Gradner—N. C.

TRY AT OUR RISK—30 DAYS TRIAL

If you want to SAVE MONEY in cooking and heating you may try the "HEAT KING" AT OUR RISK—Prove that it ends drudgery and dirt of coal or wood, cuts fuel bills in half, pays for itself quickly by what it SAVES. You must be satisfied under our liberal guarantee or YOU PAY FOR THE BURNER ABSOLUTELY NOTHING.

Slips Into Any STOVE RANGE or FURNACE

—QUICK HEAT on or off AT TURN of VALVE

FREE SAMPLE to Agents

and salesmen offered to one energetic man or woman in each locality who will demonstrate and take orders. Send no money—just sign and mail coupon (or 1c postcard will do). You can't lose for here's a revolutionary cheap new type oil burner that is safe, economical and efficient. So mail coupon quick, be first in your locality to learn how satisfactory oil heat can really be and how you can MAKE REAL MONEY spare or full time. Mail Coupon or 1c postcard today—NOW

AGENTS SALESMEN DISTRIBUTORS—BIG MONEY

Startling low price puts this amazing new-type oil burner within the reach of everyone. No wonder so many homes, small business firms, oil filling stations, etc., are buying it—no wonder salesmen and distributors are breaking records in sales. All YOU have to do is to bring it to the attention of prospects and show how it gives QUICK HEAT, HOTTER, CHEAPER, WITHOUT DIRT AND ASHES, and how it quickly pays for itself by what IT SAVES—then, reap BIG CASH PROFITS. It sells fast because low-priced, cheap to operate, efficient.

WHAT SALESMEN SAY:

Greatly pleased with installation. Installed one when weather was 10 degrees below zero. Kept

house well heated and owner is still raving about the wonderful burner. I can dispose of 250 "HEAT KING" before this year ends.—F. Silver—Canada.

Demand for oil burners is great. Have fifteen salesmen starting. Would like to turn out 200 burners a week—C. A. Pierce—N. Y.

Heat King satisfactory in demonstration to one of the largest oil companies—W. Daffern—Ohio.

I am a plumber, have installed all kinds of oil burners but, I never knew before there was such a thing to get that much heat out of oil. There is money in selling them—W. C. Nicholson—Ind. If you want to DOUBLE and TREBLE your earnings and own your own business, you can't beat the "HEAT KING" as a money maker. Get YOUR OWN OIL BURNER SAMPLE AT NO COST and CASH IN BIG PROFITS. Act quick—be FIRST in your locality—MAIL COUPON at right or 1c postcard today—NOW.

UNITED FACTORIES

P-751 Factory Building

Kansas City, Mo.

MAIL COUPON

UNITED FACTORIES, P-751 Factory Building, Kansas City, Mo.

Without cost or obligation, rush generous TRIAL OFFER on the wonderful "HEAT KING" Oil Burner sent WITHOUT RISK TO ME.

Name.....

Address.....

City.....

State.....

☐ Check here if you also want to know how to make money in sales agency of your own and get NO COST SAMPLE. This does NOT obligate in any way.

Be the Boss of a store on wheels

Every day is Independence Day for the man who owns his own business. Here's the way a few of the right kind of men can accomplish that ambition.

The Bowes "Seal-Fast" Corporation can use eight to ten more men who would like to own their own jobbing business. You have a complete modern jobbing establishment on wheels. You call on your territory with a full



"After two years with Bowes I find they offer a sound proposition without equal, and with a 'human-being' attitude in all their relations with their distributors.

You're in business for yourself, yet the Bowes organization is right behind you."

—Roger Foster

Your turnover is rapid (often as much as 8 times a year). You receive complete factory training free. Your territory is protected. Your profits are protected.



A complete
"Store on wheels"



Headquarters for a Bowes distributor

Any man who has the ability to meet people can succeed at this work. Write at once giving your experience and the section of the country where you would prefer to work. We'll send you complete information. If you have the qualifications we'll pay your way into the factory for a full discussion. Just send your name and qualifications.

Bowes "Seal-Fast" Corporation
Indianapolis, Indiana
London, England Hamilton, Ontario



**FREE
FOLDER**

Write today for our folder outlining the Bowes proposition. Bowes "Seal-Fast" Corporation, Indianapolis, Ind., Dept. G.

Chemistry—and You

(Continued from Coloroto Section)

on a scale comparable to that in this country. Indeed, the world and particularly America swung into a new era of progress, which may be called either the Chemical Era or the Scientific Era. The change definitely marked the passing of economic leadership from the machine builder to the scientist, with chemistry serving as a common bridge between all of the sciences involved—and most sciences are involved.

The machine did not decline in importance—it is, perhaps, even more important than it was. But we have moved to a higher plane of progress, into a higher air of economic development, that begins where the plane of the Machine Age stopped. The machine is simply a means toward doing better and at less cost what was once done by hand and foot power. It is essentially a labor-saving device. Science is concerned with labor-saving too, but it is far more vitally concerned with creation—the creation of new knowledge, of new materials and new products, of new industries and new employment, and of improved health and material welfare for all of us, from the proudest to the humblest.

The awakening of the chemical industry was the birth of a new viewpoint and of a new idea of responsibility infinitely more daring than man had yet conceived. On the one hand it recognized the imperfections in our progress, while on the other it challenged the complacency which held imperfection to be an inevitable characteristic of human effort, about which little or nothing could be done. Under the old viewpoint we believed man could not possibly improve on nature's materials and deemed successful imitation of them the height of human achievement. Under the new viewpoint we threw attempted imitation to the winds and set out boldly to become creators in our own right of wholly new materials that nature had failed to supply.

Nature is still omnipotent in her own vast sphere. The chemist is seeking neither to paint the lily nor to perfume the rose. However, he is seeking, and finding, colors, perfumes and drugs far more satisfactory for man's purposes than any nature has provided in flowers and plants.

(Continued to page 134A)

DANGER
SLEET
SNOW
FROST
MIST

*Avoid
Accidents—
Keep windshield
clear with*

K-M

**AUTO FAN
& DEFROSTER**

*from
The K-M Family Circle*

\$3.95

Flexible rubber blades—absolutely **SAFE!** Keeps entire windshield clear. Ventilates car in summer, too. Quiet. Uses minimum current. Handy-on-and-off switch. Quickly, easily installed. Complete with ample cord and attachment clips. Look for the K M wherever accessories are sold. **K M Electric Speed Drill**, handy, powerful, dependable—only \$9.95.



KNAPP-MONARCH CO., St. Louis, U.S.A.

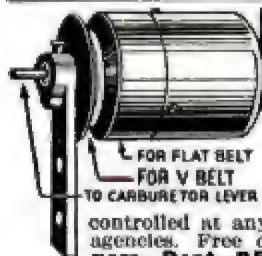


HOME AUTOMATIC CIGARETTE MACHINE
Have YOUR OWN Monogrammed Cigarettes
Put tobacco and block of papers on machine. **TURN THE CRANK**—**PRESS—CIGARETTES**. Easy—simple. All metal construction. Guaranteed. No clock required, no special tube or cigarette papers required. **ASK FOR FREE ILLUSTRATED FOLDER.**
A.C. MACHINE WKS., P.M.-12. 1055-57 Devon Ave., Chicago, Ill.

**New Adding Machine
Fits Vest Pocket!..**

Adds, subtracts and multiplies up to one billion. Weighs only 4 ounces. **Not a toy**—strong guarantee. Absolutely accurate, very fast. Sells in offices, stores, homes—wherever figures are used. Write quick for **FREE AGENTS** sample offer and Money-Making Plan.

VE-PO-AD Co., Dept. 109, 303 W. Monroe St., Chicago



**AUTO ENGINE SPEED CONTROL
GOVERNORS**

FOR FLAT BELT
FOR V BELT
TO CARBURETOR LEVER

To control speed of ANY MAKE of auto engine, regardless of load changes, when used as a stationary or portable power plant. Fully guaranteed. C.O.D. or no cash down plan. Engine may be controlled at any speed. Fine opportunity for established agencies. Free circulars. **Mfgs. Candee-Smith Governors.** Dept. BB, 215 North L. A. St., Los Angeles.

(Continued from page 132A)

He is seeking, and finding, ways to improve natural foodstuffs to the end that we will be healthier. He is erecting barriers to protect us against the hazards of disease with which nature has surrounded us under her law that only the fittest should survive. The chemist is taking such common things as air, water, coal, salt, lime and the like and compounding them or their components into a great new category of materials capable of serving us better than any of the natural substitutes to the use of which we have been limited for centuries.

(Continued next month)

Electrical Theater of the Sky Has Rooftop Planetarium

In a nine-story building of modern architecture in Osaka, Japan, is the far east's only museum of electrical science. They call it an electric "theater of the sky," for on the sixth floor is a huge planetarium whose spherical roof is the ninth floor ceiling. The building is beautifully illuminated at night, and its thirteen-story tower has a great lighted star. The roof is a mammoth globe with lands and oceans marked in colored mosaic. The motor for the planetarium was too large for the elevator and had to be hoisted with a crane.



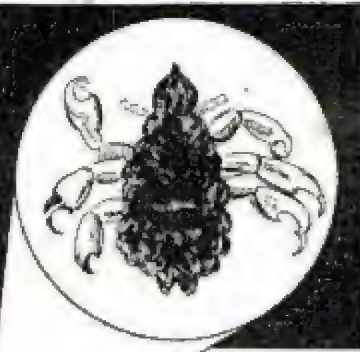
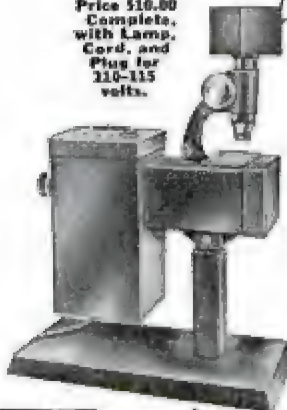
NEW THRILLS for Young Scientists!

Project Microscopic
Subjects in
Gigantic Size
with this New

SCIENCE
Craft

**MICRO-
PROJECTOR**

Price \$10.00
Complete,
with Lamp,
Cord, and
Plug for
110-115
volts.



With this new scientific instrument the tiniest insect looks as big as a ferocious monster! A drop of pond water reveals a new world of living, darting organisms! The reactions of chemical compounds become clearly visible and the formations of beautiful crystal designs in many colors are fascinating and enlightening! Any subject which can be observed with a microscope can be projected in magnified size on a screen or white wall.

Included is a prepared subject ready to use, also equipment and instructions for preparing additional easily obtained specimens.

Ask for the ScienceCraft MICRO-PROJECTOR at your favorite store. If unobtainable, we will send direct, prepaid, upon receipt of price.

of Home Experiments containing startling tricks and experiments you can do with materials found at home, also a Christmas Present Mystery and complete information about CHEM-CRAFT and SCIENCE-CRAFT Outfits.

FREE BOOK

The PORTER CHEMICAL COMPANY
4812 Prospect Avenue Hagerstown, Maryland

BURN YOUR NAME ON TOOLS WITH THE ARKOGRAF

PROTECT YOUR TOOLS FROM THEFT

Write with electricity any name or design on the hardest and finest tools and instruments, or any metal, like writing on paper with pen or pencil. Complete Outfit \$3.50—Paid Anywhere. Free illustrated circular free. Write today. Agents wanted. ARKOGRAF PEN CO., 3827 S.E. Stark St., Portland, Ore.



HOLD-E-ZEE

FINE SCREWDRIVERS

Hold, start and set up any screw in unhandy places. Gripper slides up out of way when not in use. All models of finest materials thrust with electric stainless blades, every layer transparent, unbreakable handles. No more expensive than ordinary screwdrivers. Patented. At auto supply, hardware and electrical stores.



UPSON
BROS., INC.
85 Exchange St.,
Rochester, N. Y.

HANDY TAP and DIES . . .

Accurate—carefully hardened and tempered. Complete range of sizes at your local five and ten cent store.

HENRY L. HANSON, WORCESTER, MASS.



Spindle SHAPER \$3

Make tongue and groove joints; shape mouldings, picture frames, plaques, etc. Limitless projects can be given a professional finish with this shaper. It has 8" x 5 1/4" steel table; stands 5 1/4" high. Uses standard 5/16" hole cutters. (Cutters 55c each). Oilless bearings. Your fractional H. P. motor runs it.

FREE CATALOG describes cash prize contest & illustrates complete power tool line: Circular Saw with oilless bearings, \$3; Drill Press, \$2.50; completely equipped lathe, \$2 & \$4.00; Sander, \$1, etc. Order today or send card for Catalog.

J & H Metal Products Co. 5 Commercial St. Rochester, N. Y.

YOUR OWN EYES DO THE SHOPPING

When you go to the hardware store to buy a file, the clerk no longer pokes through boxes, unwraps yards of brown paper * * Your own eyes do your shopping. without delays . . .

WHERE? Easy to find in the store, popular Nicholson or Black Diamond Files are out-from-under the counter, readily available in a colorful, conveniently partitioned display . . .



WHAT TYPE? Each type and size has a place of its own, clearly marked for easy selection . . .



WHAT CUT? Cellophane wrapping on each file lets you examine it closely, yet protects it from handling damage . . .



HOW MUCH? You'll find the price of each type and size clearly marked . . . just pick the one you want and pay the clerk * * Whether you're a plant executive, a workman, or a spare-time hobbyist, count on the new tooth construction and special file steel of Nicholson or Black Diamond Files to start and finish any job. At your hardware dealer's, Nicholson File Co., Providence, R. I., U. S. A.

PATENTED

A FILE FOR EVERY PURPOSE

When writing please mention Popular Mechanics

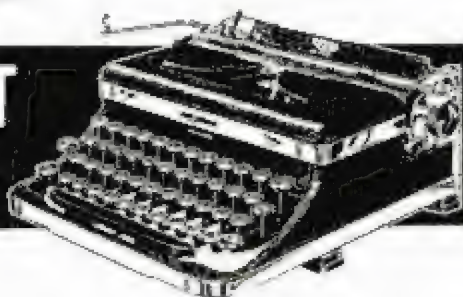
MAKE MORE MONEY

GET AHEAD FASTER!



"Take advantage of this free offer. Send the coupon right now. I got a big raise—just while trying out a Royal. I sent my ideas in to the boss—typed."

START NOW!



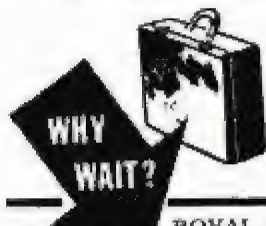
Own a ROYAL PORTABLE ON YOUR OWN TERMS!

You've ideas—ideas that are worth real money to you. Don't waste them . . . Present them *right* to the *right* people—worked out in your spare time—*typewritten*. Easy! Even if you've never thought of typing—if you own a *Royal Portable*! For Royals are scientifically designed for *everyone* to use. With full-sized standard keyboard and such genuine office typewriter features as Royal's famous Touch Control, Finger Comfort Keys, Complete Dust Protection and many others to make writing easier!

Only a Few Cents a Day

Get the facts! Try the Royal Portable in your own home *free*! And remember you can own a Royal on your own terms . . . cash, or only a few cents a day.

FREE! Carrying Case and Instant Typing Chart



Handsome triple-purpose convertible Carrying Case; also a *free* Instant Typing Chart. Latest invention—it shows you, at a glance, how to type *right*.

ROYAL TYPEWRITER COMPANY, Inc.
Dept. A-82, 2 Park Avenue, New York City, N. Y.

Please tell me how I can own—for only a few cents a day—a latest model, factory-new Royal Portable—complete with *free* Carrying Case and Instant Typing Chart.

Name

Street

City State

I already own a Typewriter.
Serial No. Tell me how much you will allow on it as CASH payment on a new Royal Portable.

Inventing Circus Laughs

(Continued from page 130A)

in the bucket. A fifteen-inch stick was fitted at one end of a frame in the bucket. The fourteen-inch fish to which a parachute was attached was molded to the stick. A heavy rubber band was inserted in a notch in a trigger at one end of the stick, pushed down against the stretch of the rubber and locked in position with a hook through an eye in the trigger. A fine wire attached to the hook was fastened to a common mousetrap. The trap is set and locked in position so it can only be released by a tug on the string. Another such trap is hooked up with a friction flint ignitor, a cup holding black powder being in the path of the spark.

The entire mechanism is set before entering the arena. Then Hershey starts fishing and pulls up for the catch. Simultaneously both traps are sprung. The first jerks the hook from its trigger and the rubber band shoots fish and parachute high into the air. The second trap jerks the ignitor, its spark ignites the powder and there is a flash and a lot of smoke, the latter for effect only. Then the fish comes floating gently down to be caught in a net. A fine steel spring, coil springs and a rat-trap all were tried for this stunt without success until the prop man hit on the slingshot idea.

"What do I get out of all this?" asks the drygoodsman who wanted to be a circus clown. "Well, each day I follow my friend over his route. Making allowance for the difference in time, I close my eyes and hear the blare of the band, sniff the familiar circus smells, see the big top crowded with people. I see my friend working this gag or that, the angry goose, the baby zep, the fishing stunt. I hear the roars of laughter, the applause. I live it over, each day and night performance, sitting here alone, waiting until the season is over and he comes back to me so we can get busy on the props for next season. It's my way of staying at home and traveling with the circus."

Names and addresses of manufacturers and dealers in articles described in this magazine will be furnished by our Bureau of Information upon request accompanied by stamped, self-addressed envelope.

"GET ME FOR SOCIAL SECURITY!"



- Keep your face clean and presentable the whole day—keep supplied with Treet Blades! Their super-keen edges say good riddance to fast-growing beards and skin irritations! Treet Safety Razor Corp., Newark, N. J.

Treet BLADES

FIT GEM AND EVER-READY RAZORS

4
FOR
10¢

FREE ELECTRICITY FROM WIND POWER



For Lights, Power, Radio, from Auto Generators New Copyright Book with over 100 Facts about Wind Chargers, Wind-Propellers—Generators—Plants—Batteries. Answers all questions you should know. Including plans for 6 or 32 V. Plant. Send 25c for plans, facts and catalog. Agents Wanted.

CURRIER MFG. CO. 422 Terminal, Minneapolis, Minn.

BUILD THE CUTTY SARK

2 H. MODEL OF THE FAMOUS CLIPPER SHIP



Complete kit
includes plans
building easy
2.50
plus 15¢
postage

Everything...including CARVED WOOD HULLS. Painted Bulwarks. Cast-Metal Lifeboats. Anchors. Bells. Steering Wheel. Chains. Mast. Spars. Rigging. Cement. Colored Lacquer—Full-Size Plans and Instructions.

Send for Catalog and Plans of new Models—10¢ IDEAL AIRPLANE & SUPPLY COMPANY, INC. 20 West 12th Street, New York

Gift of 1000 Thrills Auto-Glide

120 MILES TO THE GALLON

Hear that youngster shout with joy when he receives his Christmas gift of a genuine AUTO-GLIDE! Sleek, speedy, brings years of pleasure and profits. Getting to school, taking pleasure spins, running errands, making deliveries, renting out, etc. Cheaper to operate than buying shoe-leather. Less than 1/8¢ a mile! Easy to ride, park. Skims along 30 miles an hour, cradled on low-pressure balloon tires.

2 models: Kari-Pac (Illustrated) or Auto-Glide (without carrier.) 1 H.P. or 1 1/4 H.P. Cushman engine. Starter, clutch, brake, light, etc.

FREE BOOK! See your dealer or write for free illustrated book with complete details!

DEALERS: Write today for Special Offer!

THE CUSHMAN MOTOR WORKS, Dept. A-12, Lincoln, Nebr.

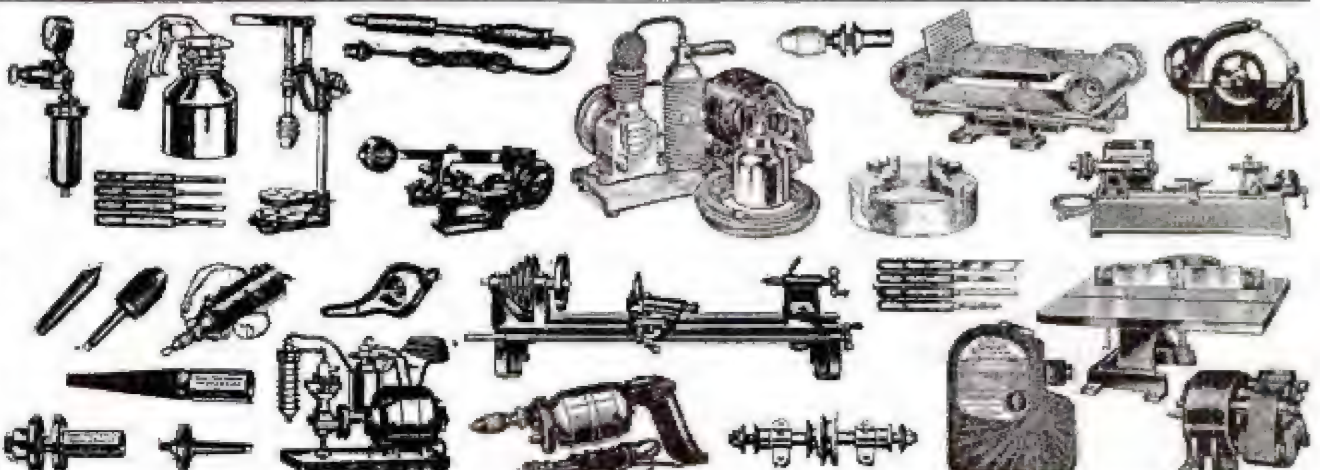


\$125

AND UP
F.O.B. FACTORY

FREE

Send for your copy of 80 page catalog



BALKO ELECTRIC MOTOR & SUPPLY CO., Dept. A 22, 10 S. Clinton St., CHICAGO, ILL.

20972

Around the World for Realism

(Continued from page 875)

main boom split near the gooseneck. At Madeira Islands, heavy seas washed away two of the lifeboats. There were several serious storms and upon leaving Guam, in the Marianas, the craft collided with the tail end of a typhoon that almost brought the excursion to an abrupt halt.

The land trips were replete with incident. According to Paul Schwegler, former All-American football star and Garnett's chief aide, governments that had seen their lands caricatured in American films avidly cooperated with the film expedition. This was particularly true in the Far East which, as any traveler will readily admit, has been grossly misrepresented by the Hollywood wizards. However, because of strict censorship in many countries, it was necessary for the camera crew



Director Garnett operating navigation instrument during the world film cruise

to make their pictures under the supervision of government attaches in military or restricted zones.

Establishment shots—those which can be put together in a picture—received the bulk of the attention in Singapore. These deal with the world-famous Raffles hotel, which has been a gathering place for the famous for almost two hundred years.

Thousands of persons who never heard of the Central Casting Bureau worked as extras without pay in the stock shots of the streets, harbors, buildings, and night spots of Cairo, Singapore and Tokio. In order to get these pictures, however, cameras had to be concealed under clothing and behind

(Continued to page 140A)



When winter comes,
Let your selection
Be oil that gives
Wide-range protection,
That starts cars cold,
Protects parts hot,
And saves you money —
Quite a lot.
Use Pennzoil for
This winter chore.
You'll get the above —
And plenty more!



Catch Fish!

Eels, Mink, Muskrats, with our new folding galvanized STEEL WIRE TRAP. Write for our FREE TRAP OFFER and Bargain Catalog. \$1 Box of our famous Fish Bait FREE to introduce our traps. WALTON SUPPLY CO., 3501 JUNIATA AVE., ST. LOUIS, MO.

ENGINES

A real money maker for farm or factory. Uses Cheap fuels. Pays for itself out of savings. Costs Less to Own—Less to Operate.



LOG SAWS

Make Money—Start a wood sawing business—turn spare timber into cash. Factory Prices—Cash or Terms—FREE Catalog.

WITTE ENGINE WORKS

1749 OAKLAND AVE.,

KANSAS CITY, MO.

ELECTROCHEMISTRY FROZEN MOTION BLACK LIGHT MAGNETISM
FLUORESCENCE

Experiment in these Scientific Subjects with ELECTRO-PHYSICS Science Outfits

SCIENCECRAFT presents the newest entertainment and scientific instruction for Home Experimenters in these complete Electro-Physics Science Outfits. They contain equipment and directions for performing astonishing experiments which demonstrate the principles of the startling and mysterious present-day inventions of the scientific world.

The Outfit shown at left, No. 495, includes a Stroboscope Flasher and Discs, an Argonne Lamp, Electrochemistry equipment, and much other apparatus with Instruction Manual explaining 145 spectacular experiments. Price \$5.00

Other equally Complete Sets at \$2, \$3.50 and \$10.

Look for SCIENCECRAFT Electro-Physics Outfits at your favorite store, or we will send your choice, fully prepaid, upon receipt of price.

FREE BOOK

of Home Experiments containing startling tricks and experiments you can do with materials found at home, also a Christmas Present Mystery and complete information about CHEM-CRAFT and SCIENCECRAFT Outfits.

The PORTER CHEMICAL COMPANY
 4612 Prospect Avenue Hagerstown, Maryland

ONE SICK HEADACHE AFTER ANOTHER

BUT THAT IS ALL OVER NOW

I FEEL grand since I began taking the

ALL-VEGETABLE Laxative, Nature's Remedy (NR Tablets). One NR Tablet convinced me... so mild, thorough, refreshing, invigorating.

Dependable relief from sick headaches, bilious spells and that tired-out feeling, when caused by or associated with constipation.

Without Risk get a 25c box of NRs from any druggist. Use for a week. If not more than pleased, return the box and we will refund purchase price. That's fair. Try it—NR Tonight—Tomorrow Alright.

Nature's Remedy
 NR-TABLETS-NR



MEAD'S NEW RANGER

CHAMPION!

FREE CATALOG
 of America's largest assortment of bicycles sent Free on request. Write now!

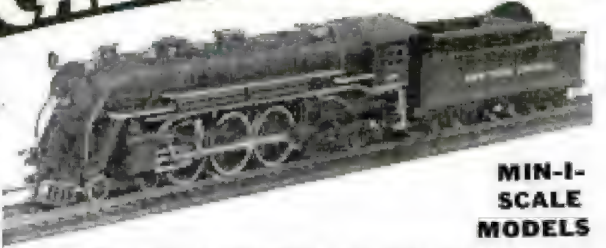
\$1 Per Week - BUT FIRST IT'S YOURS TO TRY FOR 30 DAYS!

After 50 years of leadership—the new water-cooled Mead's **CHAMPION**! Built in speedometer. Jump into the saddle—try it a whole month at our risk. Then, if not perfectly satisfied, return at O.P.R. expense. (Limit 1000000). Have to buying direct from Mead. Send postal for free catalog, easy terms and special offers!

MEAD CYCLE CO., 15 South Market, Dept. A-118, CHICAGO, U.S.A.

SCALE MODEL TRAINS

"O" Gauge 17/64" Scale



MIN-I-SCALE MODELS

Perfect, die cast scale models, accurate to the smallest detail. Absolute scale accuracy. Sturdy construction. Precision workmanship. All locomotives "run-in" under power. Both kits and assembled units—Pullmans, Box Cars, Combination Baggage and Day Coaches, Tank Cars and Hoppers. Kits easily assembled without drilling or machining. Castings prime coated. Ask your dealer or send name and 3c stamp for full information.

CONGRESS TOOL & DIE CO.

9037 Lumpkin Ave., Detroit, Mich.

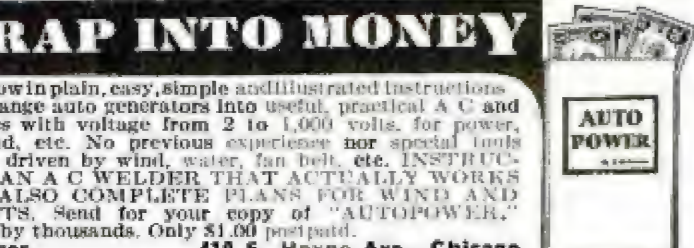
FREE FOLDER

TURN SCRAP INTO MONEY

AUTOPOWER tells you how in plain, easy, simple and illustrated instructions that anyone can follow. Change auto generators into useful, practical A C and D C generators and motors with voltage from 2 to 1,000 volts. for power, light, welding, radio, sound, etc. No previous experience nor special tools needed. Generators can be driven by wind, water, fan belt, etc. **INSTRUCTIONS FOR BUILDING AN A C WELDER THAT ACTUALLY WORKS UP TO A 3/16" ROD. ALSO COMPLETE PLANS FOR WIND AND WATER POWER PLANTS.** Send for your copy of "AUTOPOWER." Already used and endorsed by thousands. Only \$1.00 postpaid.

S. W. DUNCAN, Publisher.

410 S. Hoyne Ave., Chicago



AUTOPOWER

ARTIFICIAL EYES

Save Money—Fit Guaranteed

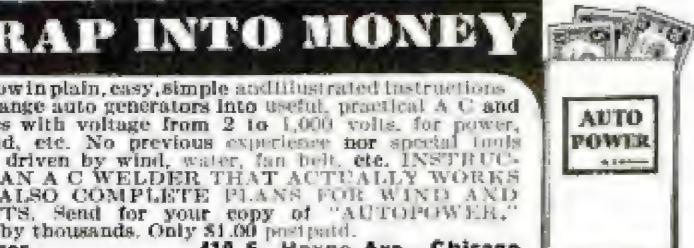
We send a large assortment for you to select from in your own home. Over 100,000 on hand at all times. All sizes, shapes, coloring. Finest quality obtainable—at substantial saving. Satisfactory fit and color guaranteed. Old reliable firm with thousands of regular customers. Send name of anyone who wears an eye for **FREE BOOK** that tells how we fit eyes for customers all over the world by mail.

DENVER OPTIC CO., 1101 University Bldg., Denver, Colo.

MAKE MONEY IN PAINTING BUSINESS

Paint walls, ceilings, screens, furniture, radiators, machinery faster, better! $\frac{1}{4}$ H. P. motor 110 Volt 60 Cycle A.C. complete with Spray Gun, 15 ft. hose. Weighs only 44 lbs. Carry anywhere. **FULLY GUARANTEED.** Only \$31.15 f. o. b. Chicago. \$5 Deposit, Balance COD, or **SEE YOUR DEALER.** Circular **FREE.** Get started making money NOW!

Only \$31.15 Complete **Ideal Pump Co., Dept. P12, 801 Washington, Chicago**



START YOUR OWN BIG-PAY WELDING BUSINESS WITH THE NEW FLEXARC MIDGET MARVEL



ONLY \$123.50 COMPLETE
FULLY GUARANTEED

You see, Westinghouse did a good turn for me when they made the FlexArc Midget Marvel. Whether I use it only a few hours a week or 48 HOURS, I make extra profits. I use it for welding everything. Fenders, motor blocks, structural or ornamental iron jobs, furnace specialities, steel, or anything that can be electrically welded... the FlexArc Midget Marvel will do all of them quicker, easier, and at less cost. And what's more, I'm not tied to my shop, I can take the FlexArc Midget Marvel right out to the job at the back seat of my car!

YOU, TOO, can make extra profits with the FlexArc Midget Marvel... the transformer welder that only Westinghouse could build because of its 51 years of transformer manufacture.

Get into welding now! The FlexArc Midget Marvel is making this big-pay business available to shops that never before could afford it. This is today's BIG opportunity. Don't miss it.

SPECIFICATIONS
Midget Marvel FlexArc A.C. Welder

- 30-140 Amperes
- 1/16-5/32 Electrodes
- 18 steps of current adjustment
- Weight-112 lbs.
- Size-11" by 14" by 14"
- \$123.50 complete with all accessories

THE DOOR-OPENER TO BIG-PAY BUSINESS

Westinghouse

The name that means everything in electricity

Westinghouse Electric and Manufacturing Company
Room 7-N, East Pittsburgh, Pa.

Without obligation, have your representative call with complete information on the New FlexArc Midget Marvel Welder.

Name _____

Address _____

BUILD-UR-OWN
COASTERS • MIDGET AUTOS • SCOOTERS •
DISC WHEELS equipped with 10"x23" (GOODRICH-GOODYEAR-FIRESTONE)
Balloon Tires offered at LOWEST PRICES



We also carry a complete line of larger Tires and Wheels, Axles, Motors, etc.
BUILD-UR-OWN DEVICES
WRITE FOR PRICES 5237 Lake St., Dept. M-12 Chicago, Ill.

BETTER WHEELS FOR LESS MONEY
BICYCLES, TRAILERS, ETC.

YOU CAN EARN \$20 per day Selling CHEX at 100% Profit

You can easily sell CHEX—Because every car and truck owner is a live prospect.

Because CHEX, the new auto radiator protector, ends freezeup worries and makes one filling of alcohol last all winter.

Because CHEX is fully automatic and can be installed in 3 minutes.

Because CHEX sells for only \$1.00 and costs you but 50c each. Attractive carton holds 24 CHEX.

If you are a live wire agent Mail this coupon today !!!

CHEX Distributors

P. O. Box 999, or Woodman Bldg., Newark, N. J.

- ☐ Send me FREE sales plan, selling helps and your "CHEX and double-CHEX" easy selling rules.
- ☐ Send me postpaid... sample CHEX @ \$1.00 each, to be credited on my first order for one carton or more. Money order is enclosed.
- ☐ Send me... attractive display cartons of 24 CHEX each at \$12.00 per carton. Money order is enclosed.

13972

(Continued from page 138A)

curtained balconies as Chinese coolies are inclined to "mugg" just as the Hollywood extra does when given half a chance.

The educational aspects of such films are reflected in the shots of the wealthy estates of the Chinese mining kings of Penang. The homes on these estates have dining rooms that will seat more than one hundred guests. Perhaps, the most incredible pictures filmed were those of the wide, paved highways through the jungles of Indo-China where a tiger or an elephant occasionally halts traffic while crossing. The camera is looked upon as an instrument of evil by certain sects in India and China and the photographers had to exercise a great amount of tact in taking their pictures. The Lamas of Mongolia are extremely camera-shy as are the Bedouin Arabs, Schwegler says. Once, Mrs. Garnett disguised herself as an Arab woman



Village chieftain in Ceylon poses with his harem for the movie camera

and with a camera concealed under her veil, attempted to shoot atmosphere pictures of the Bedouins as she rode through a village on a camel. The picture-making went well until the camel shied. In the ensuing confusion, Mrs. Garnett's blonde hair as well as her camera were revealed to the desert nomads. It was only by quick work on the part of her guide that trouble was averted.

Likewise, in filming religious exercises of the Mohammedans, Shackelford had to take care that his shadow did not cross tables containing food or sacred objects. It is their belief that the stomach of the

(Continued to page 143A)

TRY THIS

ALL-PURPOSE MOTO-TOOL

TODAY MONEY BACK TRIAL

saves time and labor on all craft work

Everybody who works with his hands—at home, shop, school or profession—can use the efficient, attractive Moto-Tool to advantage. Grinds, drills, carves, polishes, etc. on all materials. Takes 10 seconds to do 10 minutes hand work. Absolutely safe—there are thousands in use. Weighs only 4 oz., operates as easily as handling a pencil. Plugs in any light socket. Amazingly powerful—about 25,000 r.p.m. Chuck handles a large variety of tools.

Model No. 1 \$9.85 POSTPAID

NEW—Model 2 MOTO-TOOL FASTER—MORE POWERFUL

Designed for heavier shop work, this practical, rugged machine is recommended where precision and accuracy are demanded. The No. 2 Moto-Tool has many refinements—unit finger grip—chucklock—snap switch—arc cleaner—better cooling—convenient hanger.

Shaping Universal Table \$2.50 Stand \$4.50
etc. Weighs 13 oz., develops about 27,000 r.p.m. Price \$16.50, postpaid.

20 pc. craftsman's tool set, for either model **\$5.75** Postpaid.

Ask your dealer for a demonstration or order by mail on 10 day money back trial. Send today for attractive FREE booklet.

DREMEL MFG. CO.
2824 CT. Racine, Wisconsin

PIPE STAGGERS STORK!



..then Joe switched to the brand of grand aroma



HELP! Send for S. P. C. A. Notify the S. P. C. C. And let's start a Society for the Prevention of Cruelty to Pipes! Smoking overstrong tobacco in a gummy bowl is a mean trick to play on a self-respecting briar. Clean it out and smoke a fine, mild tobacco like Sir Walter Raleigh. Fragrant. Slow-burning. Blended of the finest burleys from the famous Blue Grass country. Two full ounces, as only a 50-pipeful tin of tobacco *could* be. Try Sir Walter!

Not a Lost Mile

FROM MAINE TO CALIFORNIA

Now, you can drive long distances by the shortest routes. The Hull Auto Compass shows your direction of travel, guides you through crossroads, saves confusion and back-tracking for only \$2.95 at your dealer. Two-piece model \$1.95. Write for circular.

HULL MFG. Co., P. O. Box 246-D8, WARREN, OHIO

HULL STREAMLINE AUTO COMPASS

TRAILER BUILDERS

SEND 25c TODAY

For big, new, 100-page Trailer Builders Manual and Catalog. Tells how to build Tops, Beds, Cabinets—all about Electric Lights, Water Systems, Floor Plans, etc. Pages of valuable ideas and suggestions for Trailer Builders, Buyers and Owners. Catalog illustrates and describes large set line of Trailer Parts, Supplies and Equipment. A complete E. L. Carling is here—over 200 items—Axles, Brakes, Hitchers, Pumps, Stoves, Mattresses, Bunks—everything from wheels to top at lowest prices! Rush 25c today—Satisfaction Positive! Guaranteed. 50c Canada \$1.00 Foreign

TRAILER SUPPLY CO. Box 438-A, Wausau, Wis.

25c

Print Your Own

Cards, stationery, circulars, tags, labels, advertising, etc. Save money. **Print for Others; Big Profits;** easy rules sent. Will do popular Raised Printing like Engraving. Junior outfit \$4.85. Senior outfit \$12 and up. Send for free catalog and all details.

THE KELSEY COMPANY, B-37 MERIDEN, CONN.

"THE NEON LIGHT sets you RIGHT."

★TEST-O-LITE

At Elec- trical Stores or \$1.50 Postpaid

Handiest electrical tester made; quickly locates trouble in electric circuits, fuses, cut-outs, motors, radios, etc. Has 1,001 uses for electricians or home. Tests any voltage 110 to 550; tells A.C. from D.C. Excels ordinary clumsy test bulb. Fountain-pen size; with pocket clip. Lifetime guarantee.

L. S. BRACH MFG. CORP., 55 Dickerson St., Newark, N. J.

SIR WALTER RALEIGH

15¢ AND WORTH IT!

SMOKING TOBACCO PIPE AND CIGARETTES

"Sooner or Later Your Favorite Tobacco"

FREE booklet tells how to make your old pipe taste better, sweeter; how to break in a new pipe. Write for copy today. Brown & Williamson Tobacco Corporation, Louisville, Kentucky, Dept. P-712.

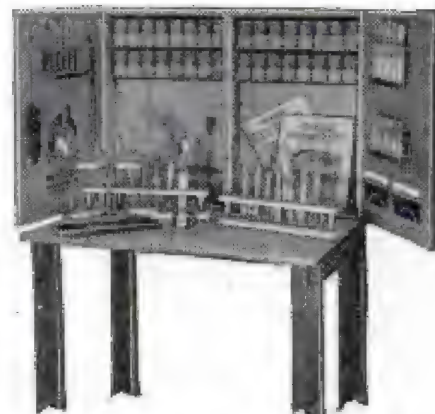
HOW TO TAKE CARE of YOUR PIPE

UNION MADE

TUNE IN TOMMY DORSEY AND HIS FAMOUS ORCHESTRA NBC BLUE NETWORK, FRIDAYS 9:30 P. M., E. S. T.

When writing please mention Popular Mechanics

It's Fun to Discover Scientific Secrets with the New GILBERT CHEMISTRY SET



New Gilbert Desk Type Laboratory Outfit—The latest triumph of the famous Gilbert Hall of Science. 5 feet of metal and wood shelf room and test-tube racks, mounted on sturdy wooden table. 76 chemicals and pieces of apparatus including scales. Puts 500 fascinating experiments at your finger tips. \$9.95. Other Gilbert Chemistry Sets \$1.00 to \$19.50. See them at your nearest toy store. Up-to-the-minute book by noted Yale professors comes with each set.



Boys, exciting days are in store for you when you own a Gilbert Chemistry Set. Think of the thrill of making strange chemicals change colors, writing messages in fire ink, making your own paints, bleaching flowers and performing hundreds of other dazzling tricks.

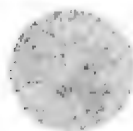
More boys have won fame and big awards with *Gilbert Chemistry Sets* than any other chemistry sets made. One boy developed a candle that burns with a blue flame. Another boy discovered a way to write messages in invisible ink on his arm. A third boy worked out a chemical

trick for catching a sneak thief. You, too, can perform such wonders, but first be sure to get a chemistry set with the name "Gilbert" stamped on the box.

\$200.00 Annual Awards

To the boy doing what, in my opinion, is the most important research in Chemistry or Micro-Chemistry in 1938, I will award \$100.00 in cash. To the ten boys doing the next most important research, I will award \$10.00 each. Applicants must not be over 17 years old and must send me full description of their experiments by June 1st, 1938.

A. C. Gilbert, Inventor of Erector and Founder of the Gilbert Hall of Science.



Sugar crystals—as seen thru ordinary Microscope.



Sugar crystals—as seen thru a Gilbert Polaroid Jr.-equipped Microscope.

POLAROID Jr.—the Invention That Shows Nature's Wonders in Full Colors

The new Gilbert Micro-Chemistry Sets enable you to see the mysteries of chemistry and Nature 200 times larger than they appear to the naked eye. The only sets of their kind with Polaroid Jr.-equipped microscope—bringing you sights far beyond the power of ordinary microscopes. Sugar crystals look like an array of brilliant jewels. Layers of cellophane take on weird and fantastic tones. Starch grains appear as luminous colored crosses. Gilbert Micro-Chemistry Set No. 7, complete with 38 fascinating pieces of apparatus and big illustrated manual, \$5.00. Other Micro-Chemistry Sets from \$2.50.



CHEMICAL WEATHER FLAG

Shows you whether each day will be rainy or clear. Free—with mammoth color poster showing the new Gilbert Chemistry Sets, if you mail coupon at once

Mail this Coupon — or 1¢ Post Card

Mr. A. C. Gilbert, President
Gilbert Hall of Science
Room-159, New Haven, Conn.

Name.....

Street.....

City.....State.....

Count me in on your big free offer. Send weather flag and mammoth poster.

(Continued from page 140A)

Moslem will not digest food that has become contaminated by even indirect contact with infidels.

A primitive race that spoke a strange native dialect furnished an interesting camera study for Garnett's party when it visited the Laccadive Islands off the west coast of India. The 3,000 inhabitants, many of whom never before had seen white men were reluctant to pose for the cameramen. It was only after the crew had conversed with the chieftain in sign language and presents of cigarettes and canned goods had been offered that the Americans were accepted. The Hollywood director learned that these natives are the descendants of survivors of a Hindu ship that had been wrecked near the islands almost a century ago.

Shackelford's film laboratory was put to an acid test on the jaunt, as weather conditions ranging from sub-zero to 145 degrees Fahrenheit were encountered. While making pictures in the jungles, Shackelford covered the film cans with tarpaulins. Over these were placed water-soaked blankets that permitted the films to be kept at a temperature fifty degrees below the thermometer reading.

Through the cooperation of the United States navy department, a motion picture production unit recently journeyed to Pago Pago, American Samoa, to make realistic backgrounds of native life and island scenery to be used in the picturization of "The Hurricane." The cameras were set up on the island of Tutuila, which itself was partially destroyed by a hurricane a year ago. Natives from Samoa and Tahiti returned with the film unit to work in scenes shot on the Goldwyn lot.

Hollywood cameras are at present probing the depths of Africa's interior under the guidance of Mrs. Osa Johnson, famed explorer. The jungle pictures are to be used in a story based on episodes in the lives of Stanley and Livingstone, English explorers.

☐ Popular Mechanics Magazine does not publish the name of the maker of, or dealer in, any device described in its pages, but this information is kept on file and will be furnished by our Bureau of Information upon request, accompanied by stamped, self-addressed envelope.

FREE!

GENEROUS TEST SAMPLE OF CASCO—AMAZING GLUE— THAT HOLDS PERMANENTLY

Good news for every man who gets fun and satisfaction out of building things or doing home repair jobs: the famous CASCO Glue—used for years in the manufacture of fine furniture, pianos, airplanes, boats—is now available in handy-size packages for home use.

CASCO glues everything... permanently: wood to wood or metal, leather, canvas, fibre-board, cardboard, paper. Makes strong water-proof crack-filler, Swedish putty, tile cement, wall sizing and water-resistant paint. CASCO is the ideal all-purpose casein glue for homecrafters. Unequalled for joints, veneers and inlays.



CASCO sets chemically—like concrete. Heat, moisture, rough usage do not affect it.

FREE PROJECT PLANS FOR HOMECRAFTERS

Every 25c (or larger) can of CASCO has a coupon entitling you to Free Plans for building any one of 24 exclusive projects. Send for Free Illustrative Folder.

SEND TODAY FOR FREE SAMPLE

(SAVE 2c: Stick this coupon on a penny postcard)

Casein Company of America, Inc.

330 Madison Ave., Dept. P. M. 1237 New York, N. Y.

- ☐ Please send me Free Test Package of CASCO
☐ Please send me Free CASCO Project Folder

Name _____

Address _____

WORM YOUR DOG



AT HOME

EASY HOME METHOD RIDES DOGS OF TAPE, ROUND AND HOOK WORMS

With the "No Guess" Pulvex Capsules, you need know nothing about worms, yet you can easily worm your dog at home... positively free him of tape, round and hook worms... without gassing, gagging or harmful effects.

Protect your dog against incomplete worming or your unfamiliarity with worms; use Pulvex Capsules, the only complete treatment in one package that expels all three types of worms. In puppy or adult size, 75c. At all pet, drug and dept. stores.

PULVEX *Combination Treatment*
WORM CAPSULES

Miracle Man of Roses

(Continued from page 821)

roses fade when the petals fall—all but this one. Its fallen petals are as brilliant as they were when the bud first opened.

"I have intensified this rose," says Dr. Schoener, "by crossing many generations of the most brilliant yellow roses I could find. In this way I have made a yellow rose whose color has as much strength as that of a red rose. If I then cross yellow and red, what should be the result? Orange, of course. I am simply mixing colors."

And in Dr. Schoener's garden blooms a brilliant orange rose.

Following out this line of reasoning, a combination of a red rose and an ordinary

are scarcely bigger than the eraser on a lead pencil, but they are true roses. Dr. Schoener plans to make some experiments of his own with the Japanese dwarf, with an eye toward producing even smaller blossoms.

Another experiment in intensifying a rose characteristic has produced gigantic blood-red thorns. It may seem that the ideal should be to breed thorns out of roses, rather than to increase their size. But under Dr. Schoener's touch even thorns have become things of beauty. These inch-long spines are translucent. Viewed with the sun behind them, they glow like rubies. But to go a step deeper, even the beauty of the thorns is not the reason for their culture. They were simply used as a medium for testing a theory of heredity.

Sometimes the theory does not work out—as in the case of a rose whose petals were white on one side and red on the other. Then, according to Dr. Schoener, you "enlarge the theory to include the new facts."

In another experiment with a combination of colors, he produced a bush bearing both white and yellow roses.

Although Dr. Schoener's interest is primarily with making illuminating experiments which later may be put to practical purpose, he has produced one rose which soon may increase the beauty of every back-yard rose garden. This is his perfect yellow rose. There is nothing new about perfect roses, roses whose petals form absolutely symmetrical flowers, but always before they have been bred in hothouses. This rose grew in a wind-swept garden. You can breed to perfection as well as abnormality.

You can also breed to strength. In fact, this is the center of Dr. Schoener's theory of plant immunity.

"People come to me," he says, "asking how to treat this and that kind of plant disease. They ask about spraying and fumigating. They never think of fighting disease at its source by increasing the immunity of plants. I predict that the biology of the future will see a great advancement in the scientific breeding of plants to make them resistant to disease."

(Continued to page 146A)



Giant thorns gleam like rubies. These were bred to prove theory of plant heredity

pale yellow one should produce brown. That is just what occurred. Dr. Schoener's brown rose has a deep rich color, slightly tending toward terra cotta.

In the same way that he intensified color, he intensified scent. He has produced a red rose with a scent so strong that in the early morning the odor can be detected a city block away.

Although the height of the giant rose trees satisfied Dr. Schoener that size can be controlled by breeding, he is toying with another "believe it or not rose." This is the smallest rose in the world, which he imported from Japan. Its tiny flowers

F I S H E R F A C T S

SEALING STEEL *for* SAFETY

in the UNISTEEL BODY by FISHER

FISHER engineers are frequently asked: where does the Unisteel Body differ from steel body building precedents? What is the chief difference between it and steel bodies of the past?

The answer is simple. Fisher engineers do not build an all-steel shell and then add the necessary braces and supports. In the Unisteel Body the outer steel panels, the inner steel structure and all steel reinforcements are fused into one single solid steel unit.

From the famous steel Turret Top to the heavy ribbed steel floor, the Unisteel Body is not only all steel—but all one weave-proof, shock-proof, glorified steel structure with no semi-solid joints.

You can see what a difference this makes



WHERE STEEL MEETS STEEL in the Unisteel Body, it is solidly fused together—there are no weak links, no joints to loosen and rattle. When finished, the Unisteel Body is all one shock-proof, weave-proof unit.

When writing to advertisers please mention Popular Mechanics



YOU'LL BE AHEAD WITH CHEVROLET— ahead in style, in comfort, in safety. For Chevrolet, "The Car That Is Complete," is the only car in its price class with Unisteel Turret Top Body by Fisher.

. . .

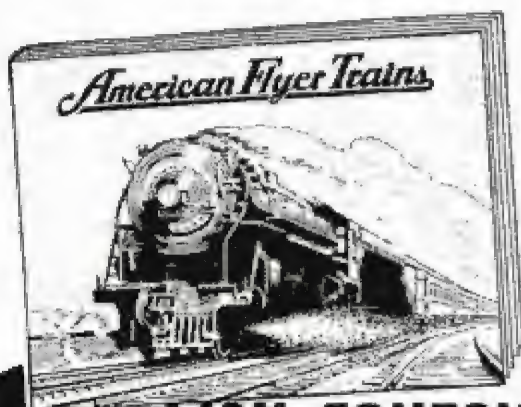
in the smooth, unbroken contours of its built-in beauty. You can feel the difference in the luxurious silence of its interior, even when the going's rough. For, as a matter of fact, the Unisteel Body is not only insulated against heat and cold—but against road rumbles, inside vibration and outside noises, too.

Remember these facts before you decide what your next car will be. Look first at the General Motors cars—the only cars with Unisteel Turret Top Body by Fisher.



ON GENERAL MOTORS CARS ONLY:

CHEVROLET • PONTIAC • OLDSMOBILE
BUICK • LA SALLE • CADILLAC



FREE MAIL COUPON for Big Train Book IN FULL COLORS

Page after page shows America's greatest train values, new and advanced features such as the amazingly low priced *six wheel drive* Hudson steam-type locomotives, the new *remote control* whistle unit, high speed model track, new transformers with circuit breakers included. All of America's famous streamline and steam-type trains have been reproduced. Select your fun-making automatic signals, stations, etc. Dads, too, make railroading a hobby.

American Flyer Mfg. Co.
2248 S. Halsted St., Chicago, Ill.

SEND FREE
TRAIN BOOK

Name

Address

American Flyer Trains

BEAN'S CANOE SHOE

Made of high grade tan elk leather with double oil tanned moccasin sole, rubber heel and Talon Fastener. It is a combination "Slipper Shoe," used for many purposes around camp, cottage and home. Colors, brown and black. Full Sizes only, 3 to 12. Widths D, EE. Men's and ladies'.

Write for New Catalog.

Mfd. by

L. L. BEAN, Inc.

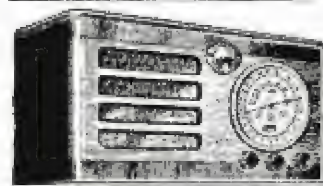
Mfrs. Hunting and
Camping Specialties

123 Main St.

Fresport, Maine



\$2.90
Postpaid



Get Europe
on this 7-TUBE 3-BAND
RCA RADIO
\$17.95

MONEY BACK IF NOT 100% SATISFIED!

Why pay fancy prices for radios? Buy from us and save up to 50%. One year written guarantee. No-risk home trial—money back if not absolutely satisfied.

AUTOMATIC TUNING...
at prices you can afford!

1938 CATALOG FREE

50 beautiful models, 3 to 15 tubes, for
FARM, HOME and AUTO.
ONE YEAR GUARANTEE

WORLD-WIDE RADIO CO., 2870 Elston Ave., Dep't. 88, CHICAGO, ILL.

Miracle Man of Roses

(Continued from page 144A)

As proof of his theory, Dr. Schoener seldom sprays his roses. Even weeds are only kept under nominal control. There is no coddling of the roses in that half acre of ground that has contributed so much to our understanding of the hereditary factors in the development of better plants, or of stranger plants—even an edible rose. Yes, a rose blooms in this garden whose buds have a rich tangy flavor, a cross between an apple and something else. For it was from a variety of apple that this freak was bred. A Spitzenburg apple was crossed with a rose and the result is a strange new taste, half apple, and half the taste of a rose.

Recently Dr. Schoener has turned to dahlia culture and produced a whole set of minor miracles—a new orange dahlia, a giant dahlia, and dahlias whose blossoms remain bright and fresh long after ordinary dahlias have faded and their petals dropped.

And it all comes of one man's passion to "make your experiments—and then you will know." Is this man a scientist? We are apt to think of science as a vast collection of apparatus, of microscopes and electroscopes, of charts and diagrams, and voluminous reports. But in reality, science is a method. A scientist makes observations, offers explanations of the phenomena he observes, makes experiments to test his theories, and draws conclusions from his experiments—the simplest conclusions that will fit the facts. Viewed in that light, science has flourished for twenty years in that little garden in Santa Barbara. It has achieved results. Dr. Schoener's roses have been exhibited in a dozen countries. He has been presented medals by many horticultural associations.

But there is one more thing necessary to make a man a scientist—purpose. "I am not interested in roses or dahlias," Dr. Schoener says, "I am interested in discovering what can and what cannot be done in breeding plants. I make no final conclusions. Science does not draw final conclusions. I merely say that when I do such and such a thing there is such and such a result. And," with a wave of his hands toward his garden, "I have my proof that all men can see."

NEW MEAD MOTOR SCOOTER

6 Miles
for
1 Cent!

EASY
TERMS

ONLY

\$89⁰⁰

F. O. B.
Chicago

Pay While You Ride
with the
Money
You Earn!



Here it is—at
last!—a Motor

Scooter so simple, so safe a child can run it YET strong enough for a heavy man! Go anywhere—at 30 miles per hour—120 talks to gallon. No other like it! Easy Terms—pay as you ride with the money you can earn from it! Shipped ready to ride. WRITE QUICK for color folder while this Special LOW PRICE, Special TERMS Offer lasts! (DEALERS! Write for available territories!)

Mead CYCLE COMPANY
DEPT BM-118 CHICAGO

Write us today
for free folder

YOU MAKE THE PROFIT WHEN YOU BUILD YOUR OWN TOOLS



Lewis castings, plus blueprint engineering service, make every metal-worker a tool-builder. Choice of 22 wood and metal working projects, engines, hoist and centrifugal pump. Easy to build. Many available semi-machined. Excellent chance to sell them at a profit. Ideal for school use. Send for free 2-color 32 page catalog illustrating all units and listing blueprints. When you build it yourself you know it is good.

LEWIS MACHINE TOOL CO.

544-5th St., Dept. D

San Francisco, Calif.

For Your Club, Class, Society!

PINS handsomely silver plated, enameled 1 or 2 colors, and 3 or 4 letters and year. Doz. Price \$3.50. Sterling or Gold Plate 50c. Doz. \$5. RINGS sterling silver, similarly low priced. Largest makers for 43 years. Over 300 designs.

Write Today for Free 1938 Catalog!

BASTIAN BROS., CO.

51 BASTIAN BLDG. ROCHESTER, N.Y.

RINGS \$1.60

35¢



ELECTRICAL KIT

ONLY
\$1.89

Make Dozens of Fascinating Experiments!

Fun! Educational! Weld iron, brass, melt glass, metal. Make arc light, 1-mil. range. Arc furnace. Ultra violet sun-tan rays. Dozens interesting experiments. Works from house light current. (List \$4.75.) Yours now for only \$1.89!

COMPLETE with carbons, resistor compensator, cord, plug, special goggles, Instr. Book, etc.

ELECTRICAL SALVAGE CO., Box 524-D, Lincoln, Nebraska

Tonight
YOU'LL NEED
THIS POWERFUL
ELECTRIC LANTERN

80 to 100 hours light on a 6-volt dry battery. 2 reflectors give either 800 ft. spot beam or big flood-light. Unbreakable lens. 6 1/2-in. tall. At hardware or electrical stores, or write Delta Electric Co., Marion, Indiana Dept. 390

APOLLO: Uses 2 No. 6 dry batteries. 7 1/2 in. tall. Big, steady light. Less batteries \$1.95



Get only a **GENUINE DELTA**

4 QUESTIONS TO ASK WHEN YOU BUY A STOVE

Will it

- 1 Circulate heated air like a warm air furnace?
- 2 Radiate heat you can feel, like a fireplace?
- 3 Direct heat rays downward to warm the floor?
- 4 End ashes and drudgery by burning fuel oil?



Superfex Heat-Director No. 1035

ONLY SUPERFEX COMBINES ALL 4 COMFORTS

Here's modern oil heating—circulating, radiating and directed heat, all from one stove. Adjustable shutters throw radiant heat outward or downward at any angle. With shutters closed, heat circulates.

The new SUPERFEX is especially designed to burn any one of a wide variety of fuel oils. See modern SUPERFEX designs at your dealer's. Several sizes, porcelain enamel finish. Send for the booklet.



The Mark of Quality

PERFECTION STOVE CO., 7875-C Platt Ave., Cleveland, O.

Please send me the booklet about SUPERFEX HEAT-DIRECTORS and RADIATING HEATERS.

Name _____

St. or R. F. D. _____

Post Office _____

County _____ State _____

NEARLY LOST GIRL HE GOT SO SKINNY AND PEPLESS



then he gained
15 lbs. QUICK
and beat his rivals out—



Walter Schoendaffer

"A bad sickness robbed me of weight and left my skin in a horribly blotchy condition. I lost all my old-time pep, and when I did go out I noticed that my play friend seemed to enjoy dancing with the other fellows more than with me. We used to quarrel about it and almost broke up several times. Then I started taking Ironized Yeast. In almost no time I began to fill out. I gained 15 lbs. in 10 weeks. My skin cleared up, too, and all my old pep came back. I'm not worrying about rivals any more and I thank Ironized Yeast."

—Walter Schoendaffer,
La Crosse, Kans.



Food by
profes-
sional
models

New IRONIZED YEAST tablets give thousands 10 to 25 lbs.—Quick!

NOW thousands of skinny, rundown persons can say goodbye to unsightly bones, certain skin eruptions and lack of pep, which rob them of friends. For with this new easy treatment many have put on normal good-looking pounds, cleared their skin naturally, gained new pep—in just a few weeks!

Doctors now say thousands are thin and rundown only because they don't get enough yeast vitamins (Vitamin B) and iron in their daily food. Without these vital elements you may lack appetite and not get the most body-building good out of what you eat.

Now, by a new process, the vitamins from the special rich yeast used in making English ale are concentrated to 7 times their strength in ordinary yeast. This 7-power vitamin concentrate is combined with 3 kinds of iron (organic, inorganic and hemoglobin iron). Pasteurized English ale yeast is then added. Finally, for your protection and benefit, every batch of Ironized Yeast is tested and retested biologically, to insure its full vitamin strength.

The result is these marvelous little Ironized Yeast tablets which have helped thousands of skinny people who needed these elements quickly to gain normally attractive pounds and new peppy health.

Make this money-back test

If, with the very first package of Ironized Yeast, you don't begin to eat better and to get more enjoyment and benefit from your food—if you don't feel better, with more strength, pep and energy—if you are not convinced that Ironized Yeast will give you the pounds of normally attractive flesh you need—your money promptly refunded. So get Ironized Yeast tablets from your druggist today.

Special FREE offer!

To start thousands building up their health right away, we make this absolutely FREE offer. Purchase a package of Ironized Yeast tablets at once, cut out the seal on the box and mail it to us with a clipping of this paragraph. We will send you a fascinating new book on health, "New Facts About Your Body." Remember, results with the very first package—or money refunded. At all druggists. Ironized Yeast Co., Inc., Dept. 5312, Atlanta, Ga.

WARNING: Beware of the many cheap substitutes.
Be sure you get the genuine Ironized Yeast.

When writing to advertisers please mention Popular Mechanics

Stoves AT FACTORY PRICES!



Sale Catalog — FREE

Nearly 200 Styles and Sizes of Stoves, Ranges, Furnaces at Factory Prices. Easy Terms—no little as 12c a day. Up to 18 mos. to pay, if you wish. 30 Days Trial. 24 Hour Shipments. Write today for this FREE CATALOG. Over 1,200,000 Satisfied Users. 37 Years in Business. Kalamazoo Stove & Furnace Co., Mfrs.

391 Rochester Ave.
Kalamazoo, Michigan

"A Kalamazoo Direct to You"

FREE CATALOG

STOPS FIRE INSTANTLY

Scientific Way

Thousands Being Sold Weekly

MORE MEN NEEDED to call on Business Concerns; Auto, Truck & Bus Owners; Schools, Public Buildings, Factories, Farms. All season seller. Excellent year round profit opportunity.

NATIONALLY ADVERTISED PRODUCTS

We help you close sales with Direct Mail Advertising, 360,000 sold to U. S. Government. Approved by Underwriters' Laboratories, also Good Housekeeping Institute. Used by 10,000 large Corporations. Write today with details of age, past experience, etc.

The Fyr-Fyter Co. Dept. 90-24 Dayton, Ohio

TYPEWRITER 1/2 Price

Easy Terms
Only 10c a Day

Save over 14 Mfg.'s Orig. Price on all standard up-to-date office models.

SEND NO MONEY

Seasonal saving on all late models completely refurbished like new. **FULLY GUARANTEED.** Big Free Catalog shows all makes in full colors. Send post-card for lowest price.

SPECIAL PORTABLE BARGAINS —

Brand New FEATHERWEIGHT—Latest Model Portable—up-to-date streamline features—now offered at amazing low price. Fully Guaranteed—10 day trial—only 10c a day. Full details sent free!

Free course in typing included.

231 W. Monroe St., Dept. 1203, Chicago

RADIOS..SAVE UP TO 50%



DEAL DIRECT...FACTORY PRICES! Many models to select from: AC-DC; A.C. Wave; armchair models; automatic tuning; car radios; Farmsets that operate like city radios! Send postcard for NEW Bargain Catalog FREE. 30 DAY TRIAL plan and agent-user proposition!

GOLDENTONE RADIO CO.
DEPT. E12, DEARBORN, MICHIGAN

30 DAY TRIAL

\$6.98 UP

Free Catalog

★ FREE ★

Gibson Guitar CATALOG

WRITE FOR A COPY TODAY!

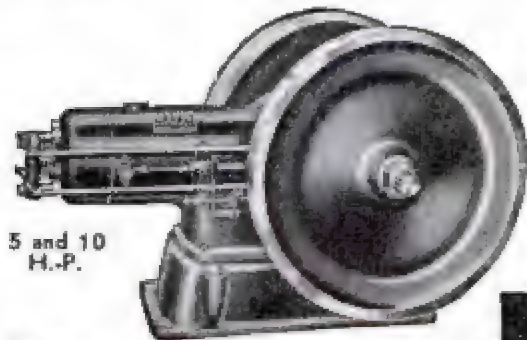
GIBSON, INC., Dept. C • Kalamazoo, Mich.

DIESELECTRIC PLANTS

UNBELIEVABLE ECONOMY

Produce **ELECTRIC LIGHT & POWER**
for **LESS than ONE CENT per KILOWATT**

Simple in design and construction, the WITTE is the most important development in the small engine field. Thoroughly modern in every respect, incorporates every worth-while advance in Diesel Engine design. The 1600 watt Dieselectric Plants are small, compact and radiator cooled. Installation is simple—upkeep low—unusual flexibility for power applications. 110 volt A.C. and D.C. plants for direct lighting. 32 volt plants for low cost battery charging.

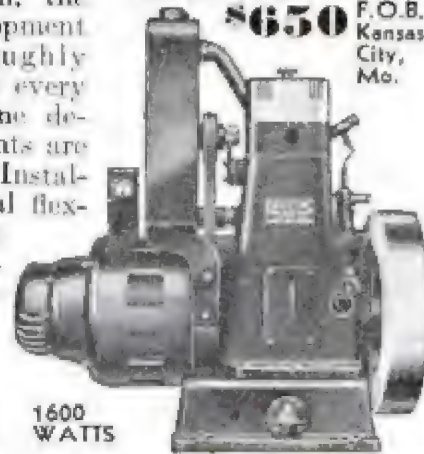


5 and 10
H.P.

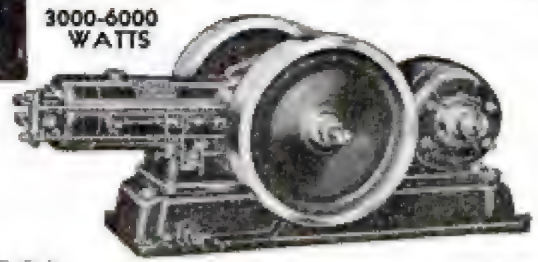
110 Volt D. C.

\$650

F.O.B.
Kansas
City,
Mo.



1600
WATTS



3000-6000
WATTS

Make your own electric light and power—be independent of the power companies. Cut your power bills 75% with a WITTE Dieselectric Plant 1600 to 6000 watts. Smooth, flickerless current—close voltage regulation. Alternating or direct current. Uses non-explosive fuel. WITTE Diesel Engines offer the small power user the same important features, operating characteristics and startling economy of the large Diesel. Quality assured by more than 67 years of manufacturing experience.

CHOOSE A DIESEL FOR POWER ECONOMY

WITTE Stationary Diesel Engines are offered in 3, 5 and 10 H.-P. sizes. Install a WITTE Diesel and **watch it pay for itself.**

RESPONSIBLE DIESEL DEALERS WANTED

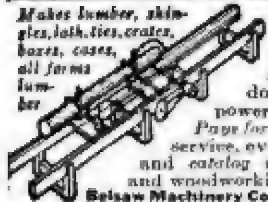
4749 Oakland Ave.

Kansas City, Mo.

WITTE ENGINE WORKS

ONE-MAN SAWMILL

Makes lumber, shingles, lath, ties, crates, boxes, casks, all forms lumber



TURN TREES INTO MONEY WITH A BELSAW

Three capacities: 10, 14 and 20 ft. Accurate set works positive dogs. Hand or power feed. Runs on low power—Many owners use old auto engine. Pays for itself quickly—thousands in commercial service, everywhere. Write for free lumber handbook and catalog of mills, supplies, tools, saw tables, and woodworking equipment.

Belsaw Machinery Co., 81104 Davidson Bldg., Kansas City, Mo.

FARM
MODEL
\$49.00



40 36" long HARDWOOD DOWELS \$2.00

MAPLE AND WHITE BIRCH

Sample Assortment of 13 Dowels, 16 inches long. 25 cents postage paid.

Send Cash With Order. Write for prices on other diameters and quantities.

ENGLEWOOD DOWEL CO.
6315 YALE AVE. CHICAGO, ILL.



EARN MONEY MAKE COLOR-GLAZED CONCRETE PRODUCTS

New low cost method. No molds or costly tools. You build your own equipment from plans we furnish. Easy to make pottery, statuary, giftware—in home or shop—to earn money.

MEN—Send 10c TODAY for booklet, details.

NATIONAL POTTERIES COMPANY
Room 6, 13 W. 26th St., Minneapolis, Minn.

RAISE GIANT FROGS

FREE BOOK



BIG DEMAND! Markets waiting for all you can ship. Good prices the year round!

WE BUY! Breeder lays 20,000 eggs yearly. Get ready now for spring season. Start with small pond, creek, lowland. Free book shows sketch. MEN & WOMEN

SEND NO MONEY Just your name and address on postcard brings special offer to beginners. Write American Frog Canning Co., (Dept. 133-XX), New Orleans, La.

IDEAL XMAS GIFT!

MANY HUNDREDS OF FASCINATING

Radio-Electrical EXPERIMENTS

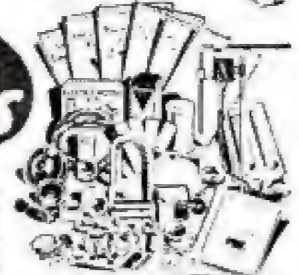
25-Piece Kit! Genuine Commercial Apparatus—Not Toys!

Dozens Experiments Wire up shield detector, extension phone, electric welder, radio code set, electroplating, air-forging, circuit tester, rectifier, 110-volt motor, arc light 4,000-lb. range, secret service power, generate sun tan health rays, make electric stove, etc.

Contains 110-volt A. C. motor, microphone, transformer, polished coil magnet or 200-volt range, electromagnet, test equipment, plotting, rheostat, condenser, 110-volt induction coil, magnet, motor, test socket, 110-volt power receiver, test cords, also etc. Our kits used by leading schools!

6 BOOKS Free with Kit! Instruction manuals, Theory of Electricity, Radio, Full power theory, Bench work, and only \$6.00 for complete kit and books (total value over \$10.00). Kit sent C.O.D. Shipped same-day order received. 3c stamp brings Bureau Catalog.

ELECTRICAL SALVAGE CO., Box 524-45, Lincoln, Nebr.



Only \$3.99
6 Books FREE

FUN AND PROFIT



FREE 40 PAGE BOOK

CRAFTSMAN OUTFITS

Get these fascinating big sets. Learn skilled craft work. Make money selling finished products.

• HOT SPOT Woodburning

Modern electric pen burns designs on wood, leather, cork, etc. Outfit includes wood, paint, patterns. Complete set making Pair of Bookends, What-Not Rack and 2 Plaques. \$2.00.

• HAMMERED BRASS

Plywood plaques and non-tarnishable jeweler's metals, with patterns, hammer, tools, full equipment for "raised metal work." Complete set making Pair of Bookends and 5 Plaques. \$2.00.

• SOLDIER CASTING

Large 3 figure mould, clamps, handles, supply of lead, paints, brushes, electric lade for making any number of big lead soldiers. Complete \$2.00.

At your dealer's or send money order to

RAPAPORT BROS.

703 E. Ohio St., Chicago



A WINNER FOR WINTER

Don't waste anti-freeze by putting it in a dirty radiator. It heats up needlessly and boils away rapidly. Spend ten cents and very few minutes to clean the radiator thoroughly with Sani-Flush.

Just pour a little of this powder in the radiator. (Follow directions on the can.) Run the motor. Drain, flush and refill with clean water. That's all there is to it. Dangerous lime deposits are purged away. Rust and scale are banished. The delicate veins of the radiator flow freely. Sani-Flush cannot injure aluminum cylinder heads or motor fittings. Look for Sani-Flush in most bathrooms for cleaning toilets. Sold by grocery, drug, hardware, and five-and-ten-cent stores—25 and 10 cent sizes. The Hygienic Products Company, Canton, Ohio.

Sani-Flush **Safe**
KEEPS RADIATORS CLEAN **NOT CAUSTIC**

DO YOU

WANT a new business profession of your own, with all the trade you can attend to? Then become a foot correctionist, and in a few weeks earn big income in service fees,—not medical nor chiropody—easy terms for home training, no further capital needed, no goods to buy, no agency. Established 1894. Address Stephenson Laboratory, 1 Back Bay, Boston, Mass.

YOU CAN GET A \$15 VALUE

Be modern! Enjoy quick, close shaves without blades, soap, brush or water.

MARVEL DRY-SHAVER

Learn how to get this double-edge Electric Dry Shaver. Write quick!

WITHOUT COST TO YOU!

NATIONAL ADVERTISERS CO., Dept. 25-N 230 E. Ohio St., Chicago



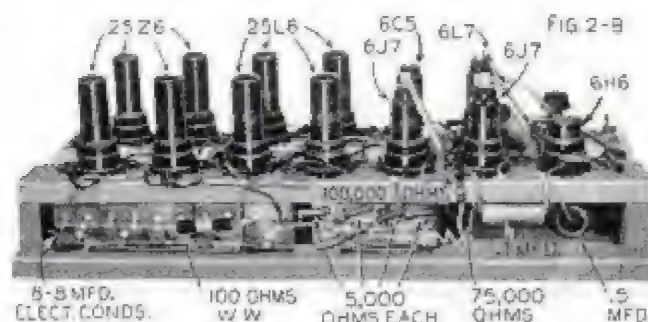
Seven-Watt A.C.-D.C. Amplifier

(Continued from page 900)

all parts are mounted on a 2-deck wood base that anyone can assemble as shown in Fig. 1. A simplified wiring diagram is given in Fig. 2. This view of the completed unit is shown in photo Fig. 2-A; rear and end-view photos appear in Figs. 2-B and 2-C.

One of the outstanding features of this audio amplifier is the fact that it may be operated either on alternating or direct current, a definite advantage where power sources often vary in different localities. The power required from the line is 95 watts, and the high-impedance input necessary is only $\frac{1}{2}$ volt for full output. This completed unit, with all metal tubes in position, weighs $10\frac{1}{2}$ pounds.

All parts are standard and easily obtained from reliable radio supply houses. A list of the original materials used and



further operating data, can be obtained upon application to Popular Mechanics radio department without charge. The blueprint number is R-246. A similar 6-tube amplifier, having only $3\frac{1}{2}$ -watt output, was described in the August, 1937, issue; the blueprint number for the smaller unit was R-241.

Five-amp. fuses should be connected in the power cable, and no external ground should be fastened to any part of the amplifier as one side of the power line is used as a common ground terminal. When plugging in try both ways and use the position that gives minimum hum. Since two sets of tubes are in series across the line, it is not advisable to pull out tubes while the power is on.

Although there are no power or inter-stage transformers in the unit, the speaker, of course, must have an output transformer on it. This transformer should have a 1,500-ohm center-tapped tube winding capable of carrying 100 ma. d.c. per leg, and

(Continued to page 152A)

The Radio Leader

AMAZING KNIGHT 11 TUBE ALL-WAVE SUPERHET

New Kits



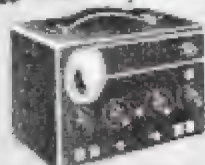
32 Build-Your-Own Kits—from a 1 Tube Set to a 14 Tube All-Wave Superhet! See these kits in the Radio Builders' section of the new ALLIED Catalog. Write for Free Parts Lists for building any set described in this magazine.

12,000 Parts



The 1938 ALLIED Catalog offers a tremendous selection of highest quality radio parts for building or repairing any circuit. All standard lines—at lowest prices—available for prompt shipment from our huge, clean stocks.

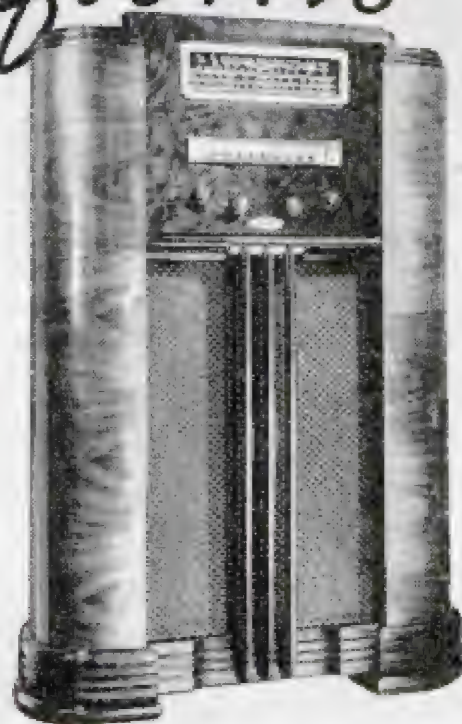
New Test Equipment



65 Newest Test Instruments—Radio's most extensive line. Oscilloscopes, Analyzers, Tube-Checkers, Set-Testers, Meters, etc. Latest factory-built and Build-Your-Own types. ALLIED offers instruments for every radio servicing or engineering need.

- AUTOMATIC ELECTRIC TUNING
- SELECT-O-MATIC DIAL
- ALL-WAVE RANGE
- AUTOMATIC FREQUENCY CONTROL
- 12" DYNAMIC SPEAKER
- PRE-SELECTOR STAGE

for 1938



ONE of 61 New KNIGHTS at Amazing Prices!

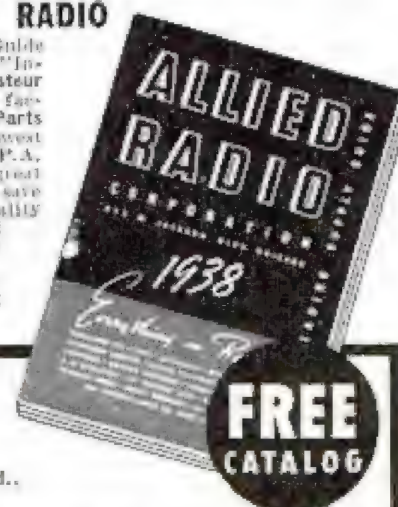
Examine all radio's newest features. Learn the magic of 1938's advancements. Then look for them all in ALLIED's Catalog—in a choice of 61 super-value Radios! For the 1938 KNIGHTS bring you radio's most thrilling features at prices that challenge the industry! KNIGHT is the sensation of 1938 Radio!

In the KNIGHT 11-Tube illustrated, you'll find Electric Push-Button Tuning—press a button and there's your station instantly. Select-O-Matic 9" Horizontal Dial with all ranges in full view. Giant 12" Electro-Dynamic Speaker. Powerful new Superhet circuit tunes everything on the air, three full bands: full 7 Watts Output—Double-tuned I.F.'s—R. F. Preselector—3-gang condenser—A.V.C.—Tone Control—all these features and more are yours at the lowest price in radio! See this sensational value now in ALLIED's new Catalog, and 60 other super-value KNIGHTS for every purpose—5 to 16 tubes—for AC, AC-DC, 6 Volt, 32 Volt, Battery, and Auto operation. Just send coupon.

THE CATALOG OF EVERYTHING IN RADIO

ALLIED's new 1938 Catalog is the Complete Supply Guide for Everyone in Radio. P. A. Systems—new KNIGHT "Integrated" Sound Systems from 8 to 60 watts. Amateur Gear—new receivers, transmitters, transceivers—both factory-built and in kit form; all leading lines. Kits—Parts—Test Instruments—Books—Tools—etc. at Radio's lowest prices. Whether you're a Radio Dealer, Serviceman, P.A. Specialist, or Amateur Experimenter, you need this great book. ALLIED's complete stocks and fast service save you time. ALLIED's low prices save you money. Quality equipment that cannot be surpassed—every item is tested and approved by our engineers. Write today for this new catalog. Send coupon now!

Write for FREE PARTS LISTS on any Popular Mechanics kit: R200—1 tube Portable; R211—2 tube AC-DC; R240—Little Giant Pup; R242—Call System; etc.



WRITE FOR FREE CATALOG TODAY

ALLIED

RADIO CORPORATION

EVERYTHING IN RADIO AT LOWEST PRICES

ALLIED RADIO CORPORATION

Dept. 5-M8,
833 W. Jackson Blvd.,
Chicago, Ill.

☐ Send your Free 1938 Catalog

☐ Send Free Parts List for

Name _____

Address _____

City _____

State _____

**FREE
CATALOG**

SEND A DIME For The Book of 16 PLANS

Delivered Postpaid



16 complete, detailed, easy-to-follow plans for making useful articles at home; specifications and list of stock included for each. All compiled into one booklet:

"Things To Make In Your Home Workshop"

Plans for making these projects:

Work Bench	Circus Toy
Tool Cabinet	Boy's Desk and Stool
Sawhorse	Adirondack Lazy Chair
Book and Magazine Rack	Wall Bookcase
Combination Table-Cupboard	Airplane Model
Folding Breakfast Unit	Portable Sewing Stand
Window Cornices	Modernistic End Table
Drop Leaf Coffee Table	Cape Cod Cottage for Birds

ALL 16 FOR 1 DIME

Mail us your address with coin or stamps NOW

STANLEY TOOLS

105 Elm Street, New Britain, Conn.

FURNACE CONTROL:

house when you get up. To build it yourself send 25 cents for drawings and specifications. For complete control with pulleys, chain, hooks for use with your clock send one dollar. Postpaid. Your installation will sell all your neighbors at handsome profit.

RUBRE COMPANY.

Shaker Square Station.

Cleveland, Ohio

Easily Installed; Simple; used with alarm clock. Opens furnace automatically. Insures warm

Free!

**THRILLING
32 PAGE BOOK**

● 39 actual photographs. Authentic history of rail-roading from 1769 to 1937. FREE with \$1.00 purchase of StromBecker Ready-To-Assemble Locomotive Models. Complete with all wood parts and supplies. No special tools or skill necessary. Send \$1.00 with this ad for all parts to build B & O Wm. Galloway Train 1837BT shown here and Modern Freight Locomotive 1922H (not shown). Finished train 14 $\frac{3}{4}$ " long. Address

Strombeck-Becker Mfg. Co., Dept. M127, Moline,

Ill. Money-back guarantee. Free catalog on request.



VEST POCKET ADDING MACHINE

IDEAL XMAS GIFT! Adds, subtracts, multiplies, divides. Does work of more costly machines. Counts up to millions, made of steel—weighs 5 ounces. Simple, accurate. Not a toy. Guaranteed 5 years.

**— FREE TRIAL —
SEND NO MONEY!**

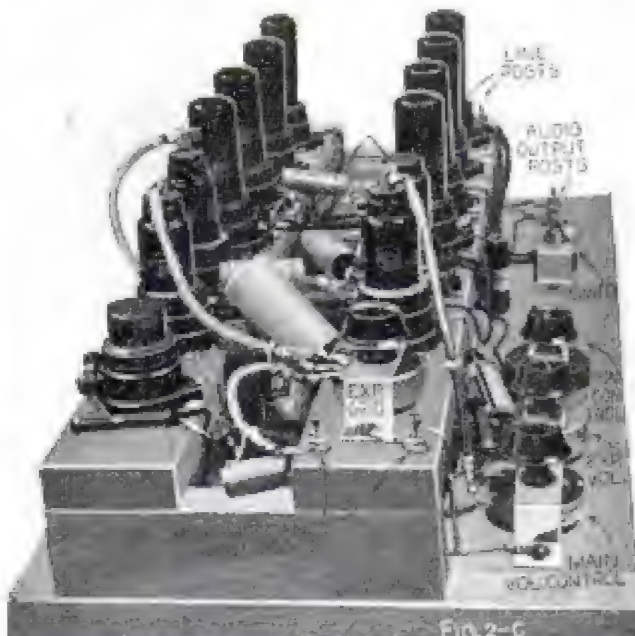
**\$2.50
Total Cost**

Order from ad, not sold in stores. Just send name and address. On delivery pay postman \$2.50 plus few cents postage. All orders in U.S. send only 10¢ additional in Leatherette Case. If not accepted after 10 days' trial you get your money back. Thousands of satisfied users. Write for home's personal. **CALCULATOR MACHINE CO.** (Mfrs.) Dept. 112, P. O. Box 1113, Chicago, Illinois

(Continued from page 150A)

secondary to suit the speaker. The "Peridynamic," and "Nokoil" and similar permanent-magnet speakers are all available with transformers of this description.

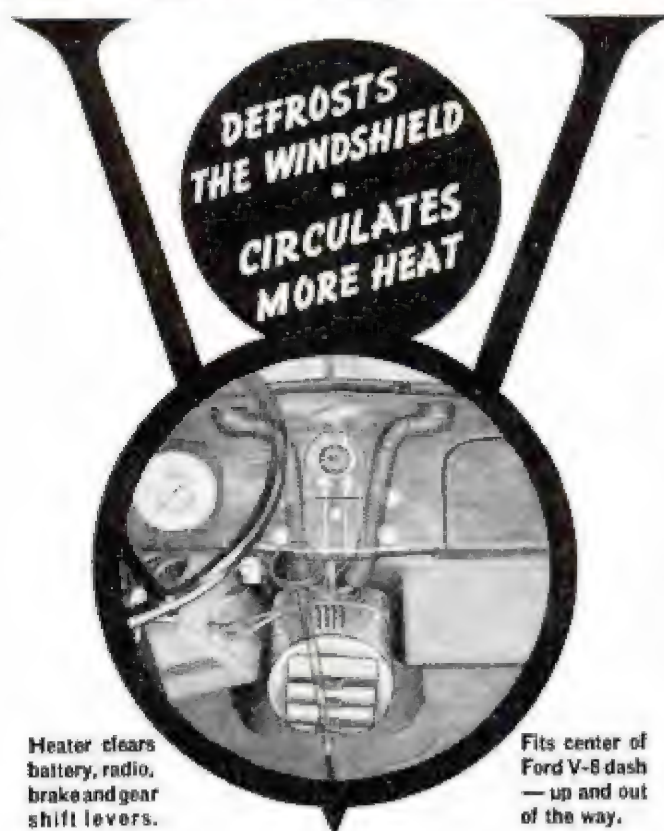
The tube heater connections must be as shown in Fig. 2. Note that an extra heater lead is used for the 6C5 and 6L7 tubes. Do not use the common ground bus-bar terminals for these heaters. The blank tube-socket terminals (X) make convenient places to solder wires that otherwise would be unsupported. Keep all grid leads as short as possible. NOTE—One lead was



omitted in wiring diagram Fig. 2; connect G2 of 25L6 tubes to left side of 100-ohm wire-wound resistor.

For the 6C5 tube the single conventional plate resistor is divided into two sections, permitting push-pull amplification with a single tube without using an input transformer. The cathode and plate resistors both carry audio frequencies, and the cathode resistors of the 6C5 must not be by-passed. Please note that one of these fixed resistors is 52,000 ohms; this unusual value is found by testing the six 50,000-ohm resistors specified in the list of materials. An ohmmeter will usually show one of these resistors about 2,000 ohms different from one of the others. The actual values of 52,000 and 50,000 ohms are not essential, only that it is desirable that they be 2,000 ohms different. Connect the lower value in series with the 2,000-ohm resistor in the cathode (K) circuit and the higher value in the plate circuit where 52,000 ohms are indicated.

Tailor Fit and PLENTY HOT FOR Ford V-8



● It's like having two heaters in your Ford V-8—with a new Arvin Duo-Flow. The double-inlet and double-outlet water pipe connections give double-action hot water circulation. New high-heat-wave radiator, high-powered motor and fan provide tremendous extra heating capacity. Does a 3-way job of defrosting, foot-warming and circulating plenty of heat throughout the car.

NOBLITT-SPARKS INDUSTRIES, Inc., Columbus, Indiana
Makers of ARVIN Phantom Filter Radios for Car and Home



When writing please mention Popular Mechanics

EASIER SHIFTING IN 1938

(Continued from page 804)

radio grille and used on control knobs and the hardware trim is an attractive plastic treatment. The de luxe steering wheel also is of plastic material.

Elimination of noise is another subject on which manufacturers have been busy during the past year. Packard uses eleven different sound-deadening materials. Buick's body bolts are mounted in zones of least vibration on the frame, reducing noise and vibration inside the car. The Chrysler line continues its soundproofing work with liberal use of rubber and new insulation sprays. Nash introduces a soundproofing method claimed to decrease noise twenty-five per cent. It consists of applying a sand compound to the under panel, adding density to the surface and damping out audible frequencies or vibrations.

Air conditioning of the automobile may be the next step for manufacturers, as a result of the optional system offered by Nash. The apparatus consists of a unit containing an air filter, a motor-driven fan and a hot-water heating element, for cleaning, warming and circulating the air inside the car in winter. Mounted under the cowl, the unit is connected to the cowl ventilator by a stack in which the air is spun by its own pressure, removing part of the moisture that is in the air if wet weather prevails. Then the air is carried into the unit through the filter, which cleans it, and past the fan, through the hot-water heating element and out into the car. The fan keeps air pressure constant when the automobile is traveling at high speeds. Drafts are eliminated because the system builds up within the car an air pressure greater than that outside.

Among other features of the 1938 models are: Packard's twice-a-year chassis lubrication; Buick's special dome-shaped pistons which permit controlled burning of the fuel mixture and a higher compression ratio without detonation, increasing horsepower seven to eight per cent without increasing bore and stroke; Cadillac's elimination of running boards on the low-slung "Sixty," a surprise entry into the field, and Chevrolet's special illumination of the ignition lock, in which the light from a small bulb shines through the spaces left by making the hole larger than the body of the lock.

\$16⁹⁵

Defroster fitting at small extra cost. Other Arvin Heaters as low as . . .
\$9.95

**I'M THE BEST GLUE
AND THE CHEAPEST
IN THE END**



LEPAGE'S
strength
FOUR FLUID OUNCES
LIQUID GLUE

The household "utility-man".
For craftsmen and manual training.
Use for fixing and repair work.
In bottles, tubes and cans.

"Shooting these indoors was
FUN!"



... and Easy, too
WITH G-E MAZDA PHOTO LAMPS

● Live over this happy Thanksgiving day with indoor snapshots. Catch that look on Junior's face as he wades into the turkey. Snap the whole family... even the pup.

It's easy. Just put a few G-E MAZDA Photoflood lamps in sockets around the room, load up your camera with supersensitive film and take snapshots as easily as outdoors in sunlight.



**SPECIAL LIGHTING KIT \$1.00
FOR INDOOR PICTURES**

Ask the dealer where you buy your film to show you this new special kit for taking indoor pictures with any camera and supersensitive pan film.

The brighter, whiter light of these amazing bulbs gets you crisp, clear pictures indoors, or at night. And they last for dozens of shots.

For action, use G-E MAZDA Photoflash lamps. Each lamp gets one picture.

Go to your druggist or camera dealer for photo lamps... but be sure they're marked G-E, to be sure of better pictures.

**GENERAL ELECTRIC
MAZDA PHOTO LAMPS**

BUILD ARC WELDER FROM OLD DODGE GENERATOR

35c brings complete plans for building economical and efficient 75 to 125 amp. arc welder, and 1938 catalog listing over 500 electrical items. 50 other generator changes.

LEJAY MFG. CO.
347 LeJay Bldg., Minneapolis, Minn.



EASY \$\$\$ FOR XMAS!



ETCH stunning Old English initials on the glasses, sell for \$1.50 to \$2.00 ea. Embellish 25c mirror, sell for \$1.00. New process etches initial, designs, etc., in 3 minutes, easy as buttering bread. Two tubes Etchall (etch 100 initials) and any 2 initial stencils (usable repeatedly) plus booklet, \$1.00. Extra stencils, 10c ea. Nothing else needed. Great first year-round profits. Order at once.

BOOKLET—"101 uses for Etchall"—10c

CRAFT SERVICE

365 University Ave. Rochester, N. Y.

MODEL AIRPLANE ENGINE

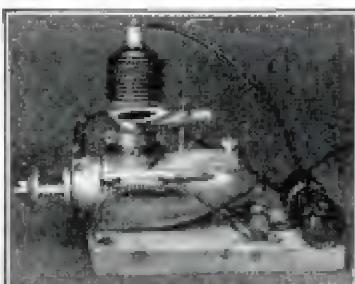
THE SYNCRO ACE

is the first modern, streamlined gasoline engine designed for model airplanes. Each engine is block tested at factory. Equipped with new, high efficiency coil, development spark plugs. Develops 1 1/3 H.P. Bore, 7/8"; stroke 15/16"; speeds from 800 to 8000 R.P.M. Special matched steel piston; special alloy connecting rod; counter-balanced crankshaft. Improved timer.

Each engine factory tested, mounted on skids and sold ready to run. (Less batteries).

Only \$15.00, from your dealer. Write for illustrated folder and full information.

SYNCRO DEVICES, INC.



511 Boydell Bldg. Detroit, Mich.

FREE
HELP YOURSELF
TO A RADIO
BARGAIN LIKE
THIS-5 TUBE SUPERHET



with
TELE DIAL

Your name on the coupon puts this new Wholesale Radio Catalog in your hands. 180 pages of "Radio Buys" . . . ultra modern sets, like model EB56. A superhet with "extra performance built-in." Extended tuning range, teledial tuning (dial your stations just as you dial a phone number). Volume and tone control give you that "studio sensation." A real radio "buy."

30 DAY FREE TRIAL!

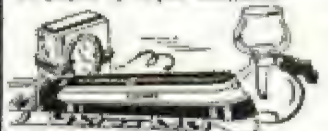
The most liberal trial plan ever offered. Try a Lafayette in your home. If, after 30 days, you are not entirely satisfied, return the set and your money will be refunded.

Model EB56
\$18.75
 COMPLETE
 WITH TUNES
 READY TO OPERATE

1938 "WHOLESALE" CATALOG FREE

Before you buy any radio send for FREE catalog—more than 70 striking models, from 7.95 to 99.50—a radio catalog PLUS with over 50,000 radio items listed and guaranteed. Sections on "Ham Equipment," public address, parts, etc. Send for FREE copy now.

Send for FREE Xmas Catalog—do all your shopping from these 40 pages of super bargains.



MAKE THIS AN Electrical Xmas

Nationally advertised electric toys at lowest prices. Electrical home appliances, toys, etc. Just compare prices. Mail coupon or paste on penny post card.

WHOLESALE RADIO SERVICE CO., INC.
 NEW YORK, N.Y. CHICAGO, ILL. ATLANTA, GA.
 100 SIXTH AVENUE 200 W. JACKSON BLVD. 430 W. PEACHTREE ST., N.W.
 BOSTON, MASS. BRONX, N.Y. NEWARK, N.J. JAMAICA, L.I.

WHOLESALE RADIO SERVICE CO., Inc.
 100 SIXTH AVENUE, NEW YORK, N. Y.

Rush FREE Catalog No. 69-7M7

Name _____

Address _____

City _____ State _____

PASTE COUPON ON PENNY POST CARD

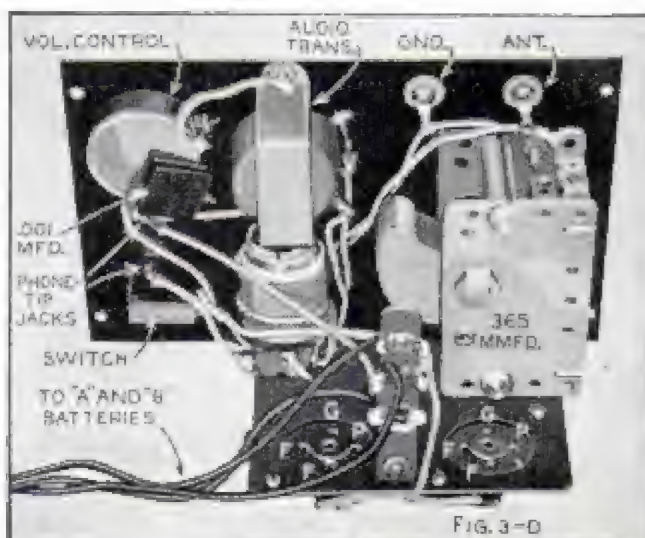
MAIL THIS COUPON NOW FREE CATALOGS

Two-Tube Portable Receiver

(Continued from page 899)

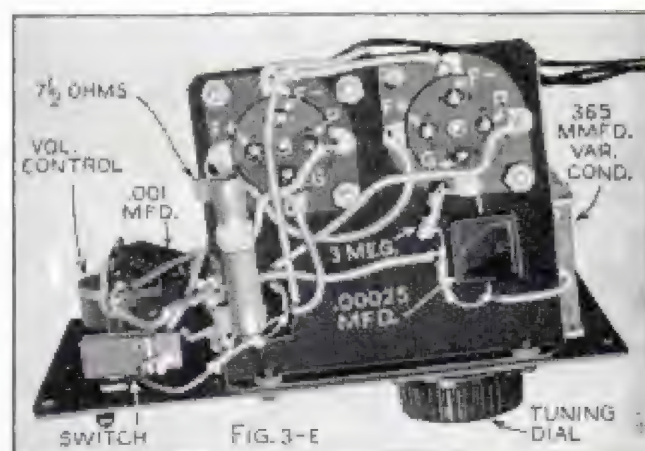
of machine screws. A schematic circuit diagram is given in Fig. 2 and the simplified wiring diagram appears in Fig. 3.

Photos Figs. 3-A, 3-B and 3-C show various views of the completed assembly; 3-D and 3-E are rear and bottom views of



the panel and base. A list of the original materials used can be obtained from Popular Mechanics radio department upon application without charge. The blueprint number is R-245. Short lengths of flexible insulated wire, terminating in grip-teeth spring clips, provide antenna and ground connections.

Volume is controlled with the potentiometer adjusting the feed-back action. To



install the set on a bicycle, use an adjustable rod-type antenna and insulate it from the frame; connect ground lead direct to frame. At the ball game or on hikes, clip antenna lead to a metal structure such as a railing, seat or fence; ground lead is not used in this case.

Just Out

NEW 1937 CATALOG OF **LIONEL** TRAINS AND ACCESSORIES

• Forty-eight pages of exciting new train combinations—with models of every great new streamliner of the nation pictured in full color. Get a copy of this big book from your nearest toy, hardware, electrical dealer or department store. Or, if you want to be the first in your neighborhood to have a copy, clip the coupon below and mail it at once with ten cents in stamps to cover the cost of postage and handling.

FREE!
AT YOUR DEALERS
OR MAIL COUPON

THE LIONEL CORPORATION, Dept. 93
15 East 26th Street, New York, N. Y.

Enclosed is ten cents in stamps to cover postage and handling. Please send a copy of the new 1937 Lionel Catalog.

Name _____

Please Print

Address _____

City _____ State _____



BUILD DUTCH WINDMILLS PROFITS FROM SPARE TIME

Beautifully your home and garden. Build Dutch Windmills, Lighthouses, Lawn Figures, Furniture, etc. Easy from our blueprints.

- B 30 Windmill 24" high as illustrated Blueprint.....65c
H 10 Lighthouse 40" high. Blueprint.....75c
E 103 Modernistic End Table Blueprint.....45c
Lawn Figure Patterns (approx. 20" high) with color arrangements.
Dutch School Boy, Tulip Girl, Sagharinet Girl, Holland Fair Puss in Boots, Jack and Jill, Little Bo-Peep, Tom the Piper's Son. Patterns, each.....35c
A 2 Colonial Doll House, 2 Story, 6 Rooms. Blueprint.....50c
Special. Clip this ad and get all the above Blueprints and Patterns. \$5.15 Value for only.....\$3.00.
For 32-Page Catalog, Send 10c.

CRAFTSMAN'S MODEL CO., Dept. P-12, 2030 N. 41st St., Milwaukee, Wis.

Red E UNIVERSAL TRACTOR

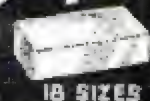
Now available with Air Tires



for greater speed and fuel economy. Low-pressure balloon type. Easy to handle, splendid traction. Also with steel wheels and lugs. Plenty of power at low cost; over 4 h. p. on belt work. Plows, discs, seeds, cultivates, etc. Write

PIONEER MFG. CO., Dept. V-127, West Allis, Wis.

MANUFACTURING OPPORTUNITIES



18 SIZES

IN BUILDING INDUSTRY—with machine and process producing permanent construction with savings of 1/3 labor, 1/2 mortar, and 1/3 material costs—solid, hollow, veneer or solid walls—plain or 40 colors.

WE EQUIP YOU with Automatic Machinery—large production only one or two men. Equipment costs but fraction of other processes with equal capacity.

INVESTIGATE—let us show you why building today offers you the greatest opportunity for growth, expansion and profit in a business of your own, using raw materials available in your territory. Write today.

W. E. DUNN MFG. CO.

600 West 24th St.

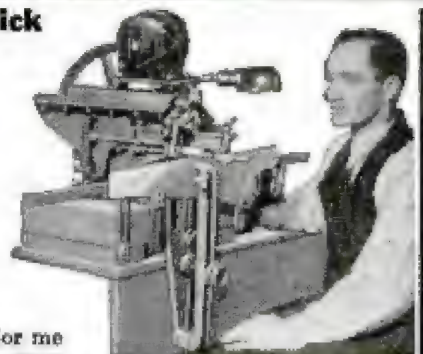
Holland, Michigan

When writing please mention Popular Mechanics

Make Big Profits Filing Saws by Machine

Louis P. Wadowick
Ohio Carpenter
Says "My

FOLEY SAW FILER



has made it possible for me to file 764 saws in spare time, and I have earned \$850 in carpenter work due directly to my saw filing contacts."

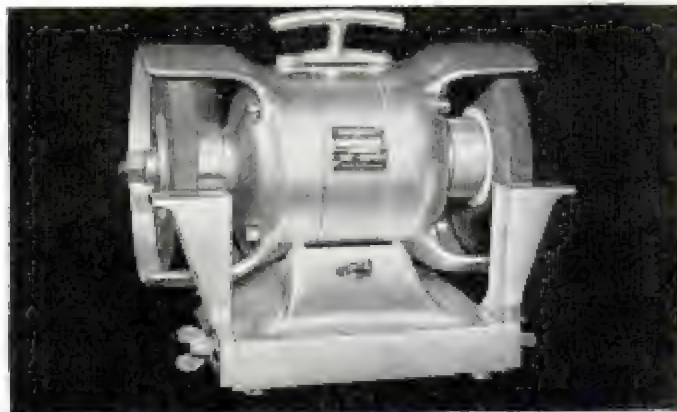
You, too, can have your own cash business at home. Earn up to \$2 to \$3 an hour filing saws automatically. No experience needed, no eyestrain. The Foley Automatic Saw Filer files hand, circular, and band saws quicker and better than the best hand filer.

SPECIAL FREE OFFER

For a limited time only, we are offering absolutely free a \$15.00 Foley Saw Setter with the Foley Saw Filer Model F-16. Other men are making big money, and building up independent year 'round businesses, why don't you? FREE PLAN shows how to start—no canvassing. Write today for details of our Special Offer. There is no obligation—no salesman will call.

FOLEY MFG. CO., 1216-7 Foley Bldg.
11 Main St. N. E., Minneapolis, Minnesota

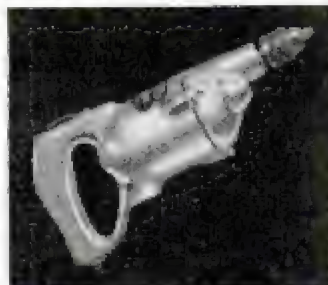
NOW only **\$19⁹⁵**
 buys a 6" Ball-Bearing
BLACK & DECKER
BENCH GRINDER



Look at these features of the new 6-Inch Junior—offered for the first time in a low-priced bench grinder of Black & Decker Quality: 1 Powerful $\frac{1}{4}$ -H.P. Motor. 2. Anti-friction ball bearings. 3. Light, strong aluminum housing. 4. Adjustable tool rests, easily removable. 5. Convenient carrying handle. 6. Rubber Feet which hold Grinder firm on bench without bolts. 7. All moving parts carefully balanced. The 6-Inch Junior Grinder is just the thing for small tool-sharpening, light grinding, polishing, wire-brushing, etc. A sensational value for..... only **\$19.95**.

BLACK & DECKER $\frac{1}{4}$ " JUNIOR DRILL

makes quick work of a thousand and one jobs around the shop, garage or home. Capacity, $\frac{1}{4}$ -inch holes in steel, $\frac{1}{2}$ -inch holes in wood. Also drives wheels for light grinding, etc. So powerful it cannot be stalled even when drilling up to rated capacity in steel. A wonderful drill for..... only **\$19.95**. $\frac{1}{2}$ -Inch JUNIOR DRILL for larger, heavier work, is an equally great value for..... only **\$35.00**.



MAIL THE COUPON TODAY for complete information and name of nearest dealer where you can see these and other Black & Decker tools.

BLACK & DECKER
World's Largest Manufacturer of
PORTABLE ELECTRIC TOOLS

MAIL THIS COUPON NOW

The Black & Decker Mfg. Co.,
 612 Pennsylvania Ave., Towson, Md.

Please send Free Literature describing the new Black & Decker Junior Tools and address of nearest B. & D. dealer.

Name.....

Occupation.....

Address.....

City..... State.....

When writing please mention Popular Mechanics

Micro-Chemistry
 Outfit No. 336—\$5.95



SCIENCE Craft Precision-Built
MICROSCOPES
 with Complete Equipment
 for Experimenters



The most reliable and efficient Microscopes for Amateur, Student and Semi-professional use. Expertly designed and constructed; equipped with ground and polished lenses, easily removed for cleaning. Guaranteed Mount-Section with clear, sharp definition; positive rack-and-pinion focusing adjustments; full tilting frames, adjustable reflecting mirrors, sure-grip stage clips and other quality features.

Three sizes: \$3.00, \$5.00, \$7.50.

Each in dust-proof wood cabinet.

Microscope Outfits containing SCIENCE Craft Microscopes and complete equipment for Microscopy, Biology, and Micro-Chemistry experiments:

Eight Sizes: \$1.25-\$2.00-\$3.00-\$3.95
 \$5.00-\$5.95-\$7.50-\$10.

Look for SCIENCE Craft Microscopes and Outfits at your favorite store, or we will send your choice, fully prepaid, on receipt of price.

of Home Experiments containing startling tricks and experiments you can do with materials found at home, also a Christmas Present Mystery and complete information about CHEM-CRAFT and SCIENCE Craft Outfits.

FREE BOOK

The PORTER CHEMICAL COMPANY
 4412 Prospect Avenue Hagerstown, Maryland

Blast Furnaces Schools and
 Craftsmen

Foundryettes include gas blast furnaces and crucibles for temperatures up to 2400 Deg. F. and allow you to make metal castings, blow glass, temper and caseharden steel and experiment with high temperatures. Three outfits available, \$13.50, \$10.00 and \$27.50. Further details November issue, Page 149A. Prices f.o.b. K. C., Mo. Weights 25, 40 and 65 lbs. Check or money order acceptable. express charges C. O. D. Write for Free Circular.

KANSAS CITY SPECIALTIES CO.

P. O. Box 6022

Kansas City, Mo.

**Century Salesmen Make
 PLENTY OF MONEY**

There is a big demand for Century
GENUINE LEATHER TIES

They are known from coast to coast for quality, workmanship and appearance. Beautiful leather in all colors. And on every tie, an EXPERIENCE NEEDED, 4-in-1 handling tool and two famous Century knots for polka-dots, stripes, leather carriers, etc. LOOK LIKE SILK; cleaned with a damp cloth. When better ties are made, Century will make them. Send 50c for samples. Ask-Hand and Hon.

CENTURY TIE CO., 2345-L, W. Grand Blvd., Detroit, Mich.

\$7.50 EACH POSTPAID

**Most Unusual
 MOVIE OFFER EVER
 MADE**
 GET BOTH
CAMERA & PROJECTOR
 for Only **\$13⁵⁰** Complete
 —and Postpaid

Everything to make and show real 16 mm. movies at less cost than taking snapshots.
CAMERA — Spring Motor drive — Automatic Release Button — Footage Indicator — 50 foot capacity. No adjustments necessary.
PROJECTOR — Quiet, smooth and flickerless — Motor driven — sturdily built. Uses any standard 16 mm. film.
 Write NOW for Big FREE Catalogue of Movie Supplies and Film Subjects. We are never undersold.
**PARAMOUNT MFG. CO., DEPT. G-91
 BOX 224, BACK BAY, BOSTON, MASS.**



FREE
 50 FOOT PRO-
 JECTOR
 FILM with
 each \$13.50
 COMBINA-
 TION.

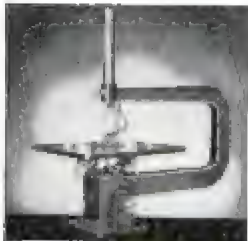
JUST PUBLISHED



NEW SHAPER

BOICE-CRANE
POWER TOOLS

Big 44 page catalog tells all about the new 1938 Boice-Crane Tools. Learn about the new modern Shaper; **Tilting Arbor Saw** with 7 New features; New 16 in. Jig Saw; New Deluxe 24 in. Jig Saw; New Spindle Sander. Also Drill Presses; Lathes; Sanders; Band Saws; Grinders; Jointers; Planers. Every page interesting to craftsmen. Ready now and tools on display at your dealers.

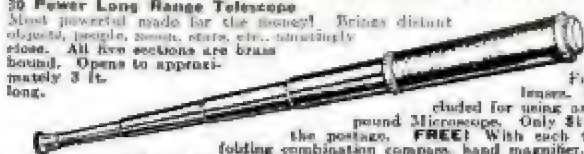
DeLuxe
24 INCH
JIGSAWFamous
TILTING
ARBOR
SAW

BOICE-CRANE CO. PM 127 TOLEDO, O.

HIGH POWERED TELESCOPE
NEW SUPER-POWER 30X "SPOTTER"

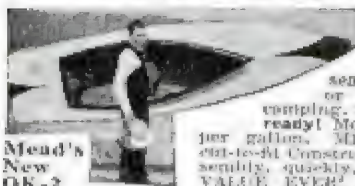
30 Power Long Range Telescope. Most powerful made for the money! Brings distant objects, people, boats, stars, etc., amazingly close. All lens sections are brass bound. Opens to approximately 3 ft. long.

\$1.75

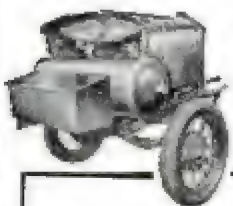


BROWNSCOPE CO. Dept. 412, 234 Fifth Ave., New York, N. Y.

BUILD THIS NEW Portable OUTBOARD BOAT In 2 DAYS AT HOME!

Mead's
New
OK-2

What thousands have been asking for... light, tough, durable, seaworthy. Take it anywhere by hand or car. Ideal for fishing, hunting, camping. Safe, leakproof, trouble-free, always ready! More speed per horsepower, more miles per gallon. MEAD'S perfected aluminum-ribbed cut-to-fit construction kit guarantees successful assembly, quickly, easily, economically. GREATEST VALUE EVER! Rush dime for details! MEAD GLIDERS, 15 S. Market, Dept. B-127, CHICAGO.

The Famous Smith
MOTOR COMPRESSOR
made from FORD PARTS

Assemble Your Own Compressor
Smith Compressor Head and Accessories are available with instructions for mounting.

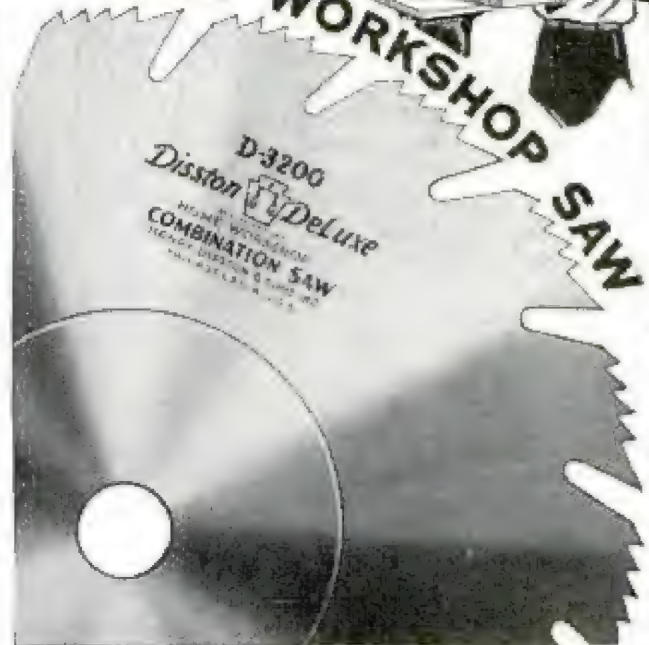
Inexpensive to Operate

Internationally used for drilling rock, breaking pavement, riveting, sand blasting, spray painting, metallizing and general use with pneumatic tools. Replaces inefficient, cumbersome compressors.

Address Inquiries to Desk D

GORDON SMITH & CO., INC.
Bowling Green, Ky.DISSTON
FINEST

HOME WORKSHOP SAW



● Times change! Homecraftsmen, like mechanics, are buying the best saws made. The thriftiest home workshop circular saw is Disston DeLuxe. On any job, it means easier, more accurate cutting. It gives a lifetime's satisfaction.

DeLuxe Cross-Cut—Rip—Combination

6" (1/2" hole), \$2.70 8" (1/2", 5/8", 3/4" hole), \$3.50
7" (1/2" hole), \$3.10 10" (5/8", 3/4" hole) ... \$4.50

DeLuxe Hollow Ground Combination

6" (1/2" hole), \$4.30 8" (1/2", 5/8", 3/4" hole), \$5.40
7" (1/2" hole), \$4.90 10" (5/8", 3/4" hole) ... \$6.90



Above, D-23 Disston. One of the finest hand saws. Lightweight, straight back, narrow blade. Easy running, fast-cutting. Beautiful finish. 26" length ... \$3.85

Also, D-8 Disston. Famous, world around, as the "Saw Most Carpenters Use." Wide blade. Skew back. Same in narrow blade for home workshop, 26" length ... \$3.50

ASK DEALER for DISSTON SAWS

— — — FREE MANUAL — — —



Write us for "Saw, Tool and File Manual" telling How to Choose and Use Saws, FREE.

Henry Disston & Sons, Inc.,
1211 Tacony, Philadelphia, U.S.A.

Name

Address

When writing please mention Popular Mechanics

Clipshaving is

QUICK SHAVING

SMOOTH SHAVING

CLOSE SHAVING



Now you can shave as you please, when you please, where you please. No need to "get ready" with CLIPSHAVE, for you can shave anywhere on a second's notice. Just plug CLIPSHAVE in any AC or DC electric socket. No blades, no brush, no lather and no bother.

CLIPSHAVE'S V-shaped notches permit every type of hair to enter and be shaved off skin-close with amazing speed. The two outside shaving edges trim sideburns with hairline accuracy and give you double shaving action—in both directions. CLIPSHAVE is clog-proof, self-cleaning and fully guaranteed. It is as economical to operate as it is to buy.



THE PERFECT CHRISTMAS GIFT

HANLEY
Clipshave

If there is no dealer near you, write Clipshave, Inc., Dept. A, Port Chester, N. Y.

Price in Canada—\$11.50

Victor A. Smith, Ltd., Lumsden Bldg., Toronto

Listed in the U.S. by Underwriters Laboratories and approved for sale in Canada by the Hydro Electric Power Commission of Ontario. Pat. No. 2,077, 307 and 2,079,893. Other patents pending.

MODERN MAGIC OF THE LIGHT BENDERS

(Continued from page 861)

nately durable under weathering, and conform to fixed standards in its ability to refract and disperse light and its component color rays. These qualities are obtained by mathematical formulas which take into consideration the raw materials in the "recipe," the purity of those ingredients, the cooking temperature and cooling time. An infinitesimal error in the density of one ingredient, a variation of but one or two degrees in the temperature of the annealing oven, may destroy the value of an entire "batch" for optical purposes. The 200-inch telescope mirror was cooled over a period of months under control. Even



The vibrometer which photographs jolts and jars and measures vibrations

during the long grinding and polishing its temperature was maintained at a precise level, for the heat of a workman's body might have affected the lens enough to warp the sensitive material, perhaps to destroy its accuracy in reflecting the image of a star.

A watchmaker may consider his work finely done if he has machined parts within 1/10,000 of an inch. To the lens grinder, inch is too coarse a term. He talks in microns—the micron is 39/1,000,000 of an

inch—and in light waves. With abrasives as fine as flour and grinders that can supply tons of pressure or the gentle dab of a powder puff, he rubs down the prism or hemisphere to within a quarter of a wave length of sodium light, or 6/10,000,000 of an inch.

Talk about splitting hairs! One of the tests of the lens designer's skill is the sharp definition obtained when his lens is focused on a diatom, a minute form of algae with a siliceous skeleton. The diameter of a single bead of the diatom is no more than 1/100,000 of an inch, or 1/400 of the width of a human hair.

The engraved lines of micrometer scales used to measure infinitesimal objects under the microscope are as fine as six microns in width and spaced ten microns apart. Some of the engraving on glass in the microscope factory is so delicate that the slightest vibration of the building affects the accuracy of the lines, and special vibrometers have been devised to test the steadiness of the building by making a jolt photograph itself. A beam of light passed through a condenser lens and a slit is reflected by a mirror floating in a pool of mercury. The reflected light passes through another slit and is recorded on a photographic film traveling in a cylindrical camera housing, with a twenty-four hour clock mechanism moving the film. When the building vibrates, the vibration is transmitted through the mercury to the floating mirror, and as it moves, the light spot moves across the photograph film and shows, when developed later, the time and intensity of the vibration.

That is just one of the methods of the optical glass worker to assure perfection in the product. How close can he come to perfection? Here is an irregular prism for example; it has seven surfaces, only two of them parallel. Some surfaces are polished, some are ground. Each must be accurate within 6/10,000,000 of an inch. Some prisms are machined so finely that if the sides were extended for forty-three miles the error from the specified angles would be less than one foot.

If your camera has a range finder, you know how accurately this optical instrument tells you the distance from your camera to the object. The same two-eyed device enables the gunner to drop a shell on a target miles away and beyond his

NEWS SHOTS FOR MOTORISTS

AMAZING GUARANTEE ENDS BATTERY REPAIR AND REPLACEMENT COSTS

You can't lose! No matter how many years you own your car—no matter how many miles you drive it—the Goodrich Kathanode Electro-Pak is guaranteed never to cost you a cent for repairs or replacement.



SAME KATHANODE CONSTRUCTION AS USED ON CRACK TRAINS

Here is a battery for your car built with the Kathanode construction—famous for its use on crack trains, airplanes, submarines. It is this long-life feature that makes it possible for Goodrich to guarantee it as long as you own your car.



DRIVES CAR 1/3 MILE WITHOUT A DROP OF GAS

On battery power alone, the Goodrich Kathanode Electro-Pak propelled a 3,150-pound car more than a third of a mile. And Western Union certified the facts!

ONLY GOODRICH ELECTRO-PAKS HAVE THE POWER-SAVING TOP COVER

This battery has a top cover that's designed to keep dirt, acid spray and corrosion locked out! See it at your Goodrich Tire and Battery Dealer or Goodrich Silver-town Store.

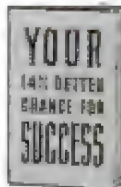


Goodrich
KATHANODE
Electro-Pak BATTERY

HOW LONG SINCE YOU HAD A RAISE?

Send for this valuable **FREE** Book

Why don't you consider getting a Royal Portable? No matter what your job, a Royal will help you attract attention from the higher-ups—help you stand out as a man worth watching. We have records of hundreds of fellows who have been promoted—had their pay raised—because of a Royal. Proof? Send the coupon below for the **FREE** Book "Your 14% Better Chance for Success." It will open your eyes.



Special offer

A FEW PENNIES A DAY
buys latest
model **ROYAL**
PORTABLE

Never before such liberal terms for a genuine Royal—the typewriter that's easy for everyone to use. Be sure to look into it while this special offer lasts.



FREE TRIAL IN YOUR OWN HOME



FREE CARRYING CASE

FREE TOUCH TYPING GUIDE

SEND THE COUPON BELOW and find out how easy it is to own a Royal. You needn't risk a penny. No obligation. Buying is as easy as renting under these special terms. And you get beautiful Carrying Case **FREE** and the famous patented Tangora Instant Touch Guide **FREE**.

GET VALUABLE FREE BOOK "Your 14% Better Chance for Success." True-life stories of what others have done—and how. Contains valuable tips on getting ahead in business, in school, in life.

Send the coupon **NOW**

ROYAL TYPEWRITER COMPANY
Dept. PE-3, 2 Park Ave., New York, N. Y.

☐ I should like to know how I can get a Royal Portable for only a FEW PENNIES A DAY, with **FREE** Carrying Case and **FREE** Touch Typing Course.

☐ I would like a **FREE TRIAL** of a Royal Portable in my home, without any obligation on my part.

Also send **FREE** copy of your book, "Your 14% Better Chance for Success."

Name _____

Address _____

City _____

State _____

Magic of the Light Benders

(Continued from page 160A)

vision. Compare the range finders of Spanish-American war days with those of today and you have an idea of the progress of the lens-grinder's science. Forty years ago 6,000 yards was the maximum distance measured for gunfire. Today the big guns make it necessary to measure ranges up to 50,000 yards, and range finders with thirty-foot bases can spot a target within 500 yards at a distance of fourteen and one-half miles.

Optical flats, the "measuring stick" for plane surfaces, are ground to an accuracy of one or two ten-millionths of an inch, which is close enough! If two perfectly flat pieces of glass or quartz are laid one on the other, touching at one edge but slightly separated at the other, an air wedge will be left between them. If the plane surface being tested is irregular, the pattern produced by the interference of light waves assumes the appearance of a contour map; if the surface is regular, the waves form concentric circles. By the position and number of the bands you can tell the location and amount of the surface irregularities. It is dangerous to bring face to face two optical flats, for the molecular cohesion will form them into a solid block almost impossible to separate without destroying their smooth surfaces. It takes from ninety-five to 100 pounds force per square inch to separate two flats.

If you are impatient and impulsive, don't ever try to become a lens grinder! It is a craft demanding infinite care; slow, patient work. It may take months to melt a "batch," months more to cool the molds of glass, and again more months to grind and polish the lens. Not more than ten per cent of a 600-pound pot of annealed glass ever reaches the form of finished lenses.

But if grinding optical glass appeals to you, start young! The experts are relatively few, and they started early. One man in a Rochester plant has been polishing tiny, magic light benders for fifty-five years and his hand and his eye still see true!

Names and addresses of manufacturers and dealers in articles described in this magazine will be furnished by our Bureau of Information upon request accompanied by stamped, self-addressed envelope.

Trindl ELECTRIC ARC WELDER

Works Off Any Storage Battery or Ordinary Light Socket...



This New Electric Arc Welder is made possible by the invention of a low voltage carbon. Auto batteries may be used without removing from car. Uses about same current as four headlight bulbs. Can be used on 110 Volt electric light socket or 32 Volt electric light plant by using a Trindl Converter in place of battery. Broken parts are SIMPLY MELTED TOGETHER by the white HOT electric arc, in just a few seconds. Produces about 7,000 degrees heat.

HOTTEST FLAME KNOWN

Melts iron and steel instantly. Welds leaders, repairs radiators, holes in bodies, milk cans, tanks and brazes broken castings.

WORKS ON ANYTHING iron, steel, copper, brass, tin or galvanized metal. Permanent repairs made for almost nothing. Used by factories in many operations. Positive money back guarantee.

AGENTS

Men with cars to sell mechanics repairmen and farmers, factories, radio and battery shops. Five minute demonstration makes sales. Up to 150% profit! Write TODAY.

Send for it Today!

TRINDL PRODUCTS, 2229-YP Calumet Ave., Chicago, Ill.

NEWS... BIG Money-Making NEWS!

Now... **THE EISEL-GEARED PIERRENCH KITS**



2 Sizes of KITS give you 9 different Super 2-Inch combinations.

...with Forged ALLOY steel to Add Years of service to this Super Parallel Pliers, Lock & Ratchet Wrench, Hand Vice... Plus. Has 1-1/2 TON Power grips for ALL Shapes in ALL Positions, and a Million Sizes between 0" and 1 1/4"!

Now, a NEW Plan to enable hundreds of New Distributors and Agents to cash in on the demand for Millions of these "Pocket Machine Shops." Also, New Demo Cases and Devices and Selling Cases for Dealer, Easier, Faster Money-Making!



MAIL this part of Ad TODAY with your address (on a postcard will do). Get FREE, 161-Picture Manual of Mechanics, with... ☐ USER Offers; or with... ☐ Distributor's and Agent's Territory Proposition for Big Full-or Part-Time Money-Making. (To present Owners... We recondition Pliers/Kits at low cost; or allow Credit on New KIT. Send Pliers/KIT in for report.)

AMERICAN PIERRENCH CORP. ZPM-461 Ravenswood Ave., CHICAGO, ILL.



BUILD CLOCKS with our help

Cash in on the demand for Mantel, Banjo, GRANDFATHER'S CLOCKS. Ask about our new, low-priced Mantel Clock and Special Blue Print Offer. Send dime for illustrated working drawing of Mantel Clock; 25c for plans of 18 Mantel & Banjo Clocks. Catalog FREE.

AMERICAN CHIME CLOCK CO.

1674 Ruffner St. (Established 1877) Philadelphia, Pa.

TRAILER PARTS CATALOGUE—FREE

Shok \$2.55; Metal Windows \$2.85; Heating Stove \$6.25; Steel step \$2.50; 108" Canvas \$1.25 yd.; Awning \$5c; Drip Moulding 5c ft.; Belt Moulding 4 1/2c ft.; Door Lock \$2.62; Chrome Wall Lamp \$1.25; Parking Legs \$2.50 pr.; Airplane dope \$2.80 gal.; Axles \$9.25 and up; 18" tubular steel chassis \$28.22; Complete Running Gear with tires \$55.90; All styles ventilators; Overhead house refrigerator \$11.90; Chrome bumper \$4.40. When you write be sure and mention Catalogue No. 10—over 300 parts at lowest prices. Kar-A-Van Industries, Inc., 2001 S. Michigan Ave., Chicago, Ill.

GOVERNS SPEED OF ANY GAS ENGINE

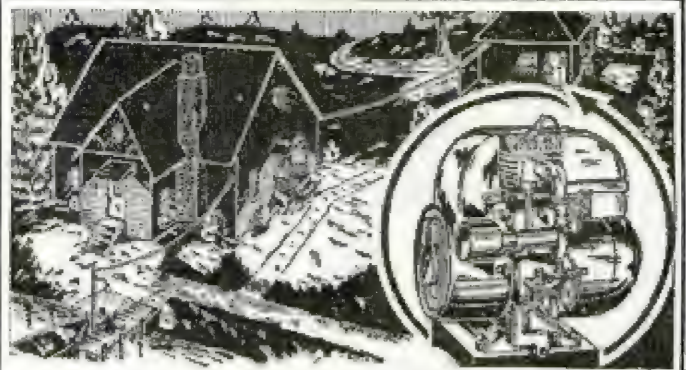
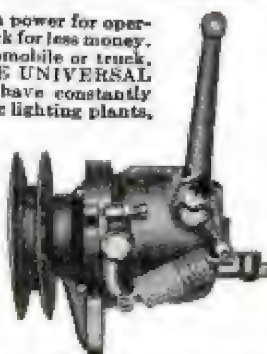
It's easy and economical to supply your own power for operating all types of machinery, and do more work for less money. Simply remove the engine from a used automobile or truck, set it up where you like, attach a PIERCE UNIVERSAL GOVERNOR, start the engine and you have constantly controlled power for the operation of electric lighting plants, are welders, refrigerating units, air compressors, feed grinders, hoists, saw mills and innumerable other applications.

The load may change but the PIERCE UNIVERSAL GOVERNOR will maintain a uniform engine speed. For close regulation of speed and dependable performance PIERCE GOVERNORS are never equalled. Installation is simple. Either V or Flat belts can be used. Governor outfits are available for nearly all makes and models of industrial engines.

Write for illustrated literature and prices.

THE PIERCE GOVERNOR COMPANY
1601 Ohio Avenue, Anderson, Indiana

PIERCE GOVERNORS
THE BRAINS OF ANY GAS ENGINE



ONAN A.C. ELECTRIC PLANTS

FOR THOSE WHO MUST PROVIDE THEIR OWN ELECTRICITY

ONAN ELECTRIC PLANTS furnish the same current as supplied by power lines—110 volt, 60 cycle, ALTERNATING CURRENT. Operate Radio, Water System, Washing Machine, Electric Iron and all Electric Appliances.

Run from gasoline or gas and generate electricity for Farms, Lake Cottages, Oil Stations, Commercial Places. A woman or child can operate it.

SIZES 350 WATTS AND UP

Each ONAN PLANT is a complete Unit, ready to run. No battery used except to start the engine. Easy to install. Available from stock. 32 volt, Direct Current Models also available. Write for details.

D. W. ONAN & SONS

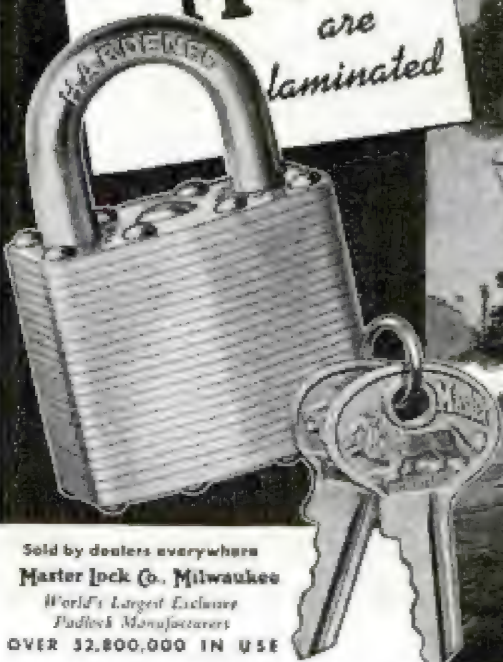
1011 Royalston Ave.

MINNEAPOLIS, MINN.

NO SELLING BE MY LOCAL BUYER!
Steady Work. Big Pay Daily! I furnish the money. Run this highly profitable business from your home— spare room— spare or full time. No experience. Full instructions furnished. Write for money-making details today!
PRUITT CO., 1181 Pruitt Bldg., Chicago, Ill.

Nothing so **STRONG** as laminated construction

No other Padlocks but **Master** are laminated



For maximum protection against torpedoes and shells, the hulls of battleships are laminated... separate layers of steel welded to one another to form armor plate much stronger than one wall of steel could ever be.

Sold by dealers everywhere
Master Lock Co., Milwaukee
World's Largest Exclusive
Padlock Manufacturers
OVER 32,800,000 IN USE

25 1023

\$2.50
Imported Algerian
BRIAR
 SWEET, MELLOW
 SMOKING PIPE ~

A \$3.30 VALUE
all for **50¢** **POST PAID**
FREE

(1) Oil Silk Tobacco Pouch
 (2) Smoking Tobacco
 (3) Pipe Cleaners

Choice of SIX Popular Shapes

ORDER BY NO., STATE 2ND CHOICE

NO. 55 BULLDOG	No. 86 Egg Shape	NO. 19 EGG BENT STEM
NO. 27 SADDLE BIT	NO. 39 APPLE	NO. 64 DUBLIN

A TIMELY value-treat for pipe smokers: The rich, mellow-smoking "WESTMINSTER 250 De Luxe"—carved of top quality, Imported Algerian BRIAR—\$2.50 quality, sent you for only 50¢! These pipes have been put aside by factory inspectors for almost imperceptible imperfections which WE GUARANTEE ON A MONEY BACK BASIS, do not affect their marvelous smoking qualities! With each "WESTMINSTER 250" we include absolutely free a 50c Oilskin Silk Tobacco pouch! A 20c Trial Size of our BRITISH PIPE MIXTURE, Blend No. 17 and 2 packages of Pipe Cleaners!

OUR GUARANTEE

If the pipe itself does not give you at least \$2.50 smoking pleasure, we refund full purchase price. Note: We reserve the right to refund your money if no more of these pipes are available when your order reaches us. Only one Special to a customer.

**SEND NO
MONEY**

Send no money unless you wish. Pay postman 50¢ upon arrival, plus 15¢ C. O. D. fee or send 50¢ coin, check or money-order and save C. O. D. fee.

(Stamps accepted, please add 2¢ towards additional handling cost.)

IF A DOLLAR BILL is more convenient to send we will include for the extra 50¢ a ¼ pound of our British Pipe Mixture, No. 88, Packed in moisture-proof metal canister (Reg. \$1.00).

HOUSE OF WESTMINSTER LTD.
 189-P Fourth Ave., New York, N. Y.

Super-Tires for Highway Express

(Continued from page 853)

of their jobs. To them and hundreds of other drivers, short-lived tires constituted a serious problem.

For many years tire manufacturers worked on the problem. They built tires that stood up well under ordinary conditions, where runs were short or stops frequent and long enough for the tires to cool off. But on runs like the one in Texas, their best tires burned up and blew out within a few thousand miles, sometimes within a few hundred. Meanwhile trucks were improving, loads growing heavier and speeds increasing—and the problem was becoming more acute. Almost feverishly tire engineers worked, driving tires to death and dissecting them afterward in the quest for the solution.

Then someone hit upon the idea of replacing ordinary cord, which could not withstand extreme heat, with another material. Armed with the results of prelimi-



Rayon cord, at top, compared to cotton cord. Note smoothness of rayon fiber

nary tests, Goodyear Tire and Rubber company turned to rayon and for seven years its engineers worked with the silky filaments and with rubber. Just recently came the announcement that their efforts had been crowned with success.

That the product was a success was demonstrated within a short time. On a 300-mile run in Texas, similar to the one already described, one company was having trouble with tires. Trucks left one end of the line at 4:30 p.m., made three brief stops, arrived at destination by midnight, unloaded and reloaded, then returned to the starting point at the same speed. So

(Continued to page 166A)

RIDE THE NEW 1938 MODEL SERVI-CYCLE

Proved 4 Years—Improved Every Year



**Real Lightweight
MOTORCYCLE**

*Safer than
a Bicycle*

Isn't It a Beauty? Powerful Motor. Strong Reinforced Frame. 100 Miles per Gallon. Fine Lighting System.

You ride Servi-Cycle with a thrill, with safety and economy. Big, rugged motor, proved 4 years, sets records at big endurance events. You learn to drive immediately. 2 steps to start; 2 brakes to stop. Fingertip control. Absolute safety. Youngsters, sportsmen ride it for fun. Grocers, druggists, service stations use Servi-Cycle to speed deliveries, cut costs.

BE AHEAD OF THE CROWD

Get free photo-brochure giving complete Servi-Cycle specifications. Write

16 Great Advances

New modernistic metallic blue finish. Motor mounted on and bottom to reduce vibration. Adjustable Timken main bearing. Improved rotary valve. Micro-matic cylinder bore. Improved carburetor. Air cleaner. Heavier links. Lighting system, with bright or dim lights. Automatic voltage control. Automatic compression release. New grips.

SIMPLEX MFG. CORP.
SUITE 403 SOUTHERN BLDG. NEW ORLEANS

\$140.00

Delivered complete. Federal tax paid.

NEW MEAD MOTOR SLED READY!

For Home Builders

Now you can easily build Mead's new streamlined MOTOR SLED or home from drawings, parts or complete construction kit. Use OUTBOARD or other engine. Low cost. Amazing speed. Seats 2. Also Ice-Boats, Ski-Yaks, Sailboats. Ask for illustrated literature. MEAD GLIDERS, 16 E. Market Dept. 12-55, CHICAGO



STEAM POWER for boats up to 30' in length. Bore 1 7/8", Stroke 1 1/2". Length 5 1/2", Width 2 1/2", Height 3 1/4". Price complete as illustrated \$2.98 postpaid. Price of engine without boiler \$1.79 postpaid. Transfer rig for above engine 30¢ postpaid. Shawnee Engine Co., Box 162, Station O, Cincinnati, O.



Only 22¢ a Day
Puts This
All-Purpose
ELECTRIC ARC WELDER
IN YOUR SHOP

TEN-DAY TRIAL
Guaranteed: 10 Months To Pay

Now, for first time, it is EASY for every inventor, laboratory, home workshop owner, garage, repair shop, and factory to afford a complete welding service for manufacturing, maintenance, experimental, or repair work. Full size, heavy-duty Electric Arc Welder—Commonwealth Model 120-FS—yours for only 22¢ a day! Has efficiency of machines costing \$250.00 to \$1,000.00. Welds all metals and alloys. Six beats handle everything from fenders and light sheet metal to motor blocks and heavy castings. Also fine for soldering and brazing.

WORKS ON 110 OR 220-VOLT A. C.

Simply plug into 110 or 220-volt, 60-cycle A. C. electric socket. Costs only few pennies an hour to operate. Anyone can use easily. Comes complete with helmet, electrode holder, welding rods, full instructions, etc. Nothing else to buy. Fully guaranteed.

WRITE FOR 22¢ A DAY PLAN

Stop throwing away profits! Do your own welding. Get sensational facts about Model 120-FS and 22¢-a-day plan. Write today!

COMMONWEALTH MFG. CORP.

Dept. C-31. 4208 Davis Lane, Cincinnati, O.

"MAKE IT A MERRIER MASONITE CHRISTMAS FOR MOTHER AND DAD!"



FOR MOTHER: A beautiful sewing box with ample room for needles, spools and all the little gadgets Mother likes to have handy when she's sewing. Divided into two compartments with hinged lids. A graceful handle makes it easy to carry. Build it with MASONITE TEMPERED PRESWOOD and you'll be proud of its smooth, lasting finish. And you'll be amazed at how easily it can be cut out and put together.

FOR DAD: The handiest tool kit he's ever seen. Light in weight . . . easy to carry . . . sturdy MASONITE TEMPERED PRESWOOD sides and bottom that can take all the knocks.

Of course, you want to build these and many other handsome Christmas gifts with Genuine MASONITE. Mail the coupon today for free plans and specifications of Mother's sewing box and Dad's tool kit.



MASONITE

THE WONDER WOOD OF A THOUSAND USES

A MISSISSIPPI PRODUCT

SOLD BY LUMBER DEALERS
EVERYWHERE

MASONITE CORPORATION, Dept. PM-12
111 W. Washington St., Chicago, Ill.

Please send me—absolutely FREE—plans and specifications for the smart sewing box and handy tool kit I'm going to build for Christmas presents.

Name _____

Address _____

City _____

State _____

es 1023

(Continued from page 164A)

KILL RATS WITHOUT POISON**K-R-O KILLS RATS ONLY****PHOTO ENLARGEMENTS**

Is Photography your hobby? Do you want a profitable new business at home? Make **PHOTO ENLARGEMENTS** for yourself and others. Your cost 5¢ each and less. The Ideal Photo Enlarger is **AUTOMATIC**. No experience required. Also **COPIES** any picture. **\$5.94 COMPLETE**. Interesting circular **FREE**.

IDEAL-O, 122 East 25th Street, New York City

5¢ ANY SIZE

For SAFE DRIVING In FOG, RAIN, SLEET, SNOW

FOG-RAY is a waterproof, quick-drying, non-inflammable liquid—easily applied—which converts regular headlights and spotlights into brilliant, penetrating fog lights, enabling you to drive safely through fog, rain, sleet or snow. **FOG-RAY** gives same results as the most expensive auxiliary fog lights, saves extra drain on the battery, adds to appearance of car. Easily removed when emergency is over. Endorsed and used by fleet owners, trucking and taxi companies. Complete set for applying and removing—enough for many applications—sent postpaid for \$1.00, on money back guarantee.

AGENTS: **FOG-RAY** sells on demonstration. Every motorist a prospect. Write today for territory, sending \$1.00 for complete demonstration set. Your money back if **FOG-RAY** does not do everything we say it will.

FOG-RAY Co. 1327 Merchants Bank Bldg., Indianapolis, Ind.

**WOODSTOCK TYPEWRITERS**

strenuous was the schedule that three trucks were being used, each making the round trip every third day and remaining in the service station forty-eight hours between trips.

Conventional tires of many makes were tried, with 3,000 miles the maximum for any tire. Each truck was refitted with two of the Goodyear tires. Truck No. 1 ran 67,000 miles before the tires broke down. On truck No. 2, one tire was destroyed by wheel failure at 73,000 miles, the other continued through 81,000, when a breaker strip began showing and it was removed to serve as a spare. On truck No. 3, one tire, run flat after a puncture, was taken



Inspector checks tire fabric for tensile strength and uniformity of twist

off at 54,000 miles. The other was removed and used as a spare after 84,000.

Cords used in the super-tire are made from filaments of a special rayon, entirely different from ordinary commercial rayon. The filaments are much finer and greater in number, running many hundreds to the cord, than in other rayon, and their tensile strength is much higher. The filaments are continuous, each running the full length of the cord, and in each tire, depending upon size, there are from sixteen to thirty-two million filaments, each anchored at its ends by tie-in around beads of steel wire.

The tire is designed with what is called a high-profile shape which is said to decrease the amount of heat generated by rapid flexing over a long period.



B575 7"
BENCH SAW
\$14.35

As shown, including guard and splitter, steel rip fence and miter gauge.

A Driver bench saw will relieve any home craftsman of much of his hardest work. The 7" blade on this tool cuts stock to $2\frac{3}{4}$ " thick. 14" x 10" ground cast iron table tilts to 45°, permitting angle cuts. Saw arbor raises and lowers. Heavy steel ripping fence. Safety guard with splitter which facilitates sawing of green or damp lumber.



J505 14"
JIG SAW
\$13.45

As shown, including pulley on machine. Motor pulley and belt extra.

Complete in itself for a great variety of creative work, this jig saw is built to give hour after hour of vibrationless, trouble-free performance. It has cast iron tubular frame with throat capacity of 14". Table 9" x 9", tilts to 45° and has accurate quadrant indicator. Enclosed drive mechanism lubricated by splash oil system. Plunger-type blower clears cutting line of sawdust.

GIFTS OF POWER TOOLS ENGINEERED TO LAST

For the beginner or veteran tool user, an inexpensive, precision-built Driver tool makes the ideal gift. Note the features on tools shown here. Proof that home craftsmen everywhere are right when they say, "Driver gives a lot of tool for the money!"



L540 GAP BED LATHE \$18.50

As shown, including 34-in. V-belt and bar wrench.

This low priced tool will handle the bulk of wood and plastic turning and metal turning jobs in the home workshop and do them well. It has sturdy cast iron gap bed 44" long and $3\frac{1}{2}$ " high. Morse Taper centers, bronze bearings, ball thrust bearing in head. Capacity: work $30\frac{1}{2}$ " long, discs 10" in diameter.

A 72-page manual is included with each of these machines. Send for the big, free 1938 catalog describing three full lines of Driver Engineered Bench Saws, Band Saws, Drill Presses, Jig Saws, Jointers, Lathes, Flexible Shafts and Motor Grinders. Walker-Turner Co., Inc., 1127 South Ave., Plainfield, N. J.



D570 DRILL
PRESS \$19.25

As shown, less motor. Includes Jacobs Key Chuck, belt and motor pulley.

Here's a superior drill press unique in its price class. It has a Jacobs ($\frac{1}{8}$ " to $\frac{3}{4}$ " Key Chuck. Bronze bearings and ball thrust bearing. Rigid cast iron frame and adjustable 8" table. Spindle travels $2\frac{3}{8}$ ". Four speeds.

DRIVER Engineered POWER TOOLS



NEW models EASIER TO PLAY

Find out about these sensational new Conn Band Instruments. Many wonderful, exclusive features! Today, more than ever, Conns are the "choice of the artists." You'll advance faster and take more pride in a genuine Conn—made by the world's largest manufacturer. See your dealer or write us for Home Trial, Easy Payment offer. Mention instrument.

C. G. CONN, LTD.
1231 Conn Bldg., Elkhart, Ind.



CONN

BAND INSTRUMENTS

WRITE
FOR
FREE
BOOK

From INDIANAPOLIS to LOUISVILLE... ON ONE GALLON OF GAS!

It's true! Over 120 miles on a gallon of gas! Startling economy of operation. High speed. True comfort. Be first in your neighborhood to own the new improved Moto-Scoot at greatly reduced price. Write for literature and name of closest distributor. See it! Drive it! No obligation!

Dealers:

Many valuable territories still open. Write today for FREE booklet.



Now Reduced
To ONLY \$89.00

See the New
Improved
Moto-Clutch—
Smooth start-
ing—Simple
operation.

Moto-Scoot

219 S. WESTERN AVENUE, CHICAGO, ILL.

SELLEY SHIP MODEL FITTINGS

SEND FOR CATALOG See Largest and most complete range of QUALITY FITTINGS—DIE CAST—BOXWOOD—BRASS PARTS at NEW LOW PRICES
SELLEY MFG. CO., Dept. 812 1377 Gates, Brooklyn, N.Y.

Build Your Own Arc Welder SAVE \$150 to \$300

Opens door to big pay jobs that carry real profit. Special "Build Your Own" unit combined with auto engine lets you operate any place. Hobart features insure easier, faster operation.

NO INVESTMENT TERMS—PROFITS PAY FOR IT

Extra earnings make it easy to own a Hobart without expense to you. If you want a profitable business, write to

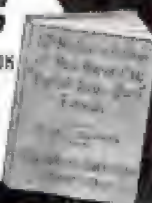
HOBART BROS.

Box M-1274

TROY, OHIO

Free!

THIS VALUABLE BOOK
Tells You How to
Build Your Own
Welder at a Saving
of \$150 to \$300



ONLY \$20 MONTHLY - 30 DAYS TRIAL At Our Risk

HOME OWNERS:- This was written for you and is sent



FREE

Get your copy!

DO your own simple home, auto and motorboat repairing and be independent of outside repair men. You will avoid delays, save much money, and have the satisfaction of knowing that the work is well done.

The booklet contains clear diagrams and directions for correct procedure for hundreds of common jobs, and enables any home worker to get dependable results, *easily*, on any of the following:

Stopping leaks in pipes, heaters, boilers, tanks, radiators, air ducts, smoke pipes, pails, etc., at connections, seams, cracks, rivets or holes.

Tightening or anchoring loose hinges, locks, handles, screws, bolts, nuts, bases, stems, tops, casters, etc.

Making waterproof joints at skylights, roof cracks and flashing.

Making wet cellars dry from the inside, making concrete floors hard, water and oil proof, and non-dusting, making masonry walls waterproof.

On the car:—Stopping leaks in the radiator at hose connections, or in oil and gasoline lines, patching cracked water jackets, crank, gear and differential cases, tightening loose rivets, mud guards, lamp standards, hub caps and lubricator connections, loose moulding screws, etc.

Smooth-On Iron Cement with which this work is done is applied without heat, without special tools, and so easily and inexpensively that half a dollar to half a hundred dollars is saved in each instance. Smooth-On has been widely used in industrial work for over 35 years and its use is standard practice by power plant engineers and repair men.



Get the booklet by mailing the coupon and buy Smooth-On No. 1 in 7-oz., 1-lb. or 5-lb. can from your hardware store or if necessary from us.

Do it with SMOOTH-ON

SMOOTH-ON MFG. CO., Dept. 37

574 Communipaw Ave., Jersey City, N. J.

Please send the free Smooth-On Repair Book.

Name.....

Address.....

12-37.....

When writing please mention Popular Mechanics



→ SAVE

ON HAMILTON, ELGIN AND BULOVA

WATCHES

★ AND HIGH GRADE ★

DIAMOND RINGS

BY USING OUR LOW MONTHLY PAYMENT PLAN AT NO EXTRA COST!

For over 40 years we've sold highest quality watches, diamond rings, silverware, and jewelry to thrifty people on dignified credit. You can buy the watch or diamond you want from us for only a few cents a day.





TURN PIN MONEY INTO DIAMONDS

Gifts for Every Occasion

Don't pay extra for credit—at the Santa Fe you pay only the low nationally advertised cash price, in small monthly payments.

Send for **FREE** Catalog

Get this Beautiful Book of Values—sent **FREE** to adults. Leading brands of watches, diamond rings, silverware, and jewelry are shown—prices and low payments plainly marked. Don't miss this opportunity by delaying—**WRITE NOW!**—We Buy Old Gold.

SANTA FE WATCH COMPANY
Dept. C-6 Thomas Bldg., Topeka, Kans.

AUTOMATIC TYPELESS PRINTER

Amazing new Print-O-Press Stencil Duplicator. Automatic feeding. Automatic inking. Full 8 1/2 x 14 legal size. Other models also, at world's lowest prices. Details free, also free samples of work done. User-Agents write

\$13.95
Complete



Professional Products
Dept. 1218, Silvertown, O.

Order direct

100 PAGE BOOK No. 10

Full of beautiful things easily made—hard to find foreign woods—lovely crotch, butt, burl, fiddle back, etc. Veneers, pencils and solid woods—hard to find hardware. How to make your own Venetian Blinds at 1/3 store prices. Scroll patterns. Inlay table tops, etc.

CRAFTSMAN WOOD SERVICE CO.
2722 Mary Street Chicago
We Ship All Over the World

PAINT SPRAY OUTFIT \$6.95

A guaranteed outfit that does the work with least effort.

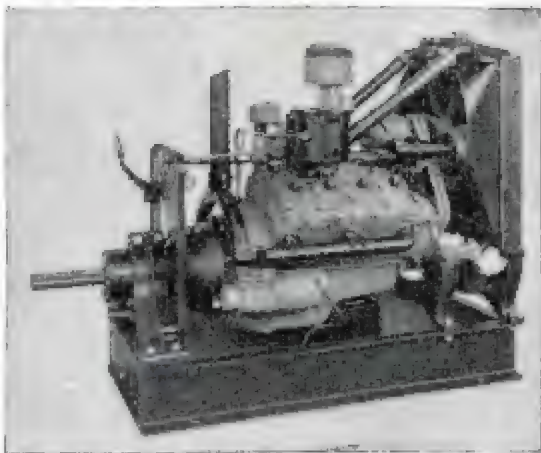


This all-purpose spray outfit has a two valve air compressor, adjustable safety air release valve, pressure type internal air spray gun, extra nozzle and downpour cup, air hose and connections, all mounting accessories and instructions. Uses a 1/4 H. P. motor, which is not included. Throw your paint brushes away. Works equally well with lacquer, enamel, or insecticide. Spray your car, spray your furniture. Compressor can be used for vacuum or operate gas blow torch for welding.

Send \$1.00, balance C. O. D.
PHILADELPHIA MACHINERY CO.
118 N. Sixth St., Philadelphia, Pa.

CAN YOU BEAT THESE POWER COSTS?

**SAVE
up to
\$293⁸⁰
Per
Month
on
power
costs**



with a KRW FORD V8 Unit

50 H. P. with KRW V8 Unit using natural gas (1125 BTU)
@ 30c per 1000 cu. ft. \$ 46.80 per month
50 H. P. with KRW V8 Unit using gasoline @ 10c per gal.
(no tax) \$ 145.60 per month

Above figures show primary fuel costs (lubricating oil not included) for operating a KRW V8 Unit to develop 50 H. P. for 10 hours per day—26 days per month. Compare this with electricity @ 3c per KWH which amounts to \$340.60 per month. You can pay for a KRW Unit in a few short weeks **out of actual savings!**

KRW V8 Units are daily saving money for operators of air conditioning and refrigeration equipment, mills, factories, shops, welders, compressors, pumps, well-drilling outfits, contractors' equipment, etc., etc.

For complete information, prices and data write us. You can buy through your local Ford Dealer and benefit by local service and low-cost Ford engine replacement feature.

K. R. WILSON 17 Lock St. BUFFALO, N.Y.
EXCLUSIVE BUILDER OF APPROVED FORD SHOP EQUIPMENT SINCE 1918



GRIP GREATEST HAND TOOL EVER BUILT

A TOOL THAT HAS DEFINITELY "CAUGHT ON"

A wrench of tremendous gripping power that **LOCKS** to the work with a grip that never slips. Holds anything, round, square or otherwise. Works in close quarters at any angle. Adjustable to fastest like action. Quick, positive, no lost motion.

Capable of exerting more than a ton of pressure yet light and handy as a pair of pliers. **ABSOLUTELY LIMITLESS** in its uses. Vise-Grip is engineered to a perfection that makes it the **CLASSIC** in hand tools. No tool user can afford to be without it. Perfect Xmas Gift. **ORDER TODAY!** Send \$1.95 for 10" size, \$1.65 for 7" size. \$3.50 for set. **WONDERFUL AGENT'S PROPOSITION. WRITE FOR FREE INFORMATION NOW!**

PETERSEN MFG. CO., Dept. P 1

DeWitt, Nebr.



YOUR OWN MOVIES! 10¢ A DAY!

NATIONALLY ADVERTISED 8MM and 16MM Movie cameras, projectors. For homes, business, church, school, club. **MONEY BACK 10 DAY TRIAL.** Payments as low as 10¢ A DAY. Satisfied customers throughout the world. **FREE** details. **WRITE TODAY.** Dan Elder's Home Movies, Dept. P.M. 12-37, 739 Boylston St., Boston, Mass.

Glub Test! A WIRELESS Pocket TUBELESS BATTERYLESS Radio

World's Smallest Real Performing Radio

Amazing Micro radio weighs only 3 ozs. complete. Rechargeable with one touch of a button. Very little static and interference. Nothing to adjust or screw trouble—should last for years.

USES PATENTED FIXED CRYSTAL DETECTOR—ENTIRELY NEW DESIGN. **MECHANICAL** patent No. 2074887. Not to be confused with cheaply made imitations or **UNLAWFUL COPIES.** Music and programs come **DIRECTLY** FROM GRILL OF RADIO! New patented "Speakephone" gives more volume and stations! **NOT A TOY.** Tunes broadcast band. The newest radio sensation of the year. Absolutely complete with picture instructions for use in hotels, offices, boats, autos, bed, etc. **TAKES ONLY A SECOND TO CONNECT**—no hookups to any current. **SATISFIED OWNERS** report wonderful service in **ALL PARTS OF THE WORLD.** **THESE ARE FACTS!** Beautiful two color cabinet, six colors. Send only **ONE DOLLAR** and pay postman balance plus postage or send \$2.99 (check, M. O. Cash) and yours will be sent postpaid. **GUARANTEED. ORDER NOW!**
TINYTONE RADIO CO., Dept. P-12, Kearney, Nebraska

SEND ONLY
\$1.00

EXTRA!

TED TINKER TELLS SECRET OF BUILDING KOOL PENGUIN!

The Koal Penguin you see so often
is a life-like wooden model.



"COULDN'T HAVE BUILT IT WITHOUT CARBORUNDUM BRAND ABRASIVES," says famous designer.



Ted Tinker sharpens
gouge on a Carborundum
Brand Silicon
Carbide Wheel.

"The real secret in building anything is to have sharp tools. That's why I can truthfully say that Mr. Koal Penguin might never have been born if it hadn't been for Carborundum Brand Abrasives. It takes only a few minutes to touch up a chisel, gouge or other edged tool."

Send for 90-Page Illustrated Book and Pocket Sharpening Stone

THE CARBORUNDUM COMPANY

Dept. PM 7-12 Niagara Falls, N. Y.

Please send me pocket size free sharpening stone with my copy of the booklet "Carborundum Brand Products for the Home Craftsman", for which I enclose 20c (coin or stamps).

Name _____

Street _____

City _____ State _____

(Carborundum and Alundum are reg. trademarks of The Carborundum Co.)

CARBORUNDUM

ABRASIVE PRODUCTS

New DURO DRILLING ATTACHMENT FOR ALL SCROLL SAWS

*EASILY ATTACHED.
*SWINGS TO ANY DESIRED POSITION
*HOLES DRILLED AT ANGLE
TABLE IS SET FOR INLAY AND RELIEF WORK



Aids in doing faster and better work. This high speed drill is quickly detachable from saw and used as a hand drill for carving, routing, grinding, filing, sanding, buffing, drilling, etc. Just the tool for the hard-to-get-at places.

Write today

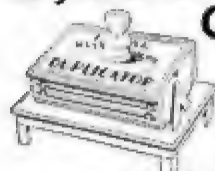
Get Your COPY OF OUR NEW 1938 CATALOG... FEATURING AMERICA'S MOST COMPLETE LINE OF WOODWORKING TOOLS



DURO METAL PRODUCTS CO.
2649 N. Kildare Ave., Chicago, Ill.
258 Broadway, New York, N. Y.

Get Only GENUINE DURO TOOLS

5,000 COPIES IN COLORS FOR 9¢



Multi-Color Machine prints in 7 colors AT ONCE. No experience required. Fine money maker. Only \$1.94 complete. SAMPLES FREE!

Multi-Color 124E. 25th St. New York

NEW Sensational "POWERED SCOOTER" \$69.50 and up

Electric. Goes 5 miles for 1c. No gasoline, oil, noise, or bother to start! Instant action—anyone can ride it—even a 3 year old child the FIRST TIME! 100 speeds—perfect control—brakes, lights, horn, etc. PLENTY OF POWER! High-speed model goes 35 m.p.h.—any speed available! Entirely self-contained power unit and charger. Simply plug into light socket (patented). Unusual range—Heavy duty three-spring frame gives smoothest ride! ULTRA STREAMLINED—available with aerodynamic carrier. Write for literature on complete line including gas models. EXCLUSIVE DEALERS WANTED.

MIDGET MOTORS CORP. Dept. P-12 Kearney, Nebr.



WET BASEMENTS!

Amazing new Seal-Seep method, anyone can use. Applied to inner masonry wall and floor surfaces; no digging. Guaranteed permanently effective. Agents write for unusual earnings opportunity. Details FREE.

National Seal-Seep Co., Dept. 1292, Cincinnati, O.



Masons—Look

Pin dollar bill to this ad and receive this genuine morocco billfold-card case. **MADE TO FIT YOUR LODGE CARD.** Holds 5 cards. Masonic emblem stamped in gold. **FREE.** Your name stamped 35c extra. Oldest Masonic supply house in U. S.

The REDDING MASONIC SUPPLY CO., Inc.
17 W. 23rd Street, New York, N. Y.

Rodents Worth Weight in Gold

(Continued from page 829)

of California. Chapman realized the full potentialities of his plan for the first time and refused to sell the animals at any price. The upshot of this incident was that someone stole thirty-five of the farm's seventy animals.

Detectives chased the animal thief across the continent but he eluded them. He did not return to Switzerland but set up his own chinchilla farm in Germany. When he was finally located, pictures of the animals were sent back to California. They had not received the proper treatment and had



The late M. F. Chapman, who founded the chinchilla farm, with one of the tiny animals

changed in appearance. As a result, the animals were never returned. Rather than risk the dangers of upsetting his pure pedigree lines, the engineer decided to carry on with the ones that had been left behind.

What was once an accepted impossibility is now an actuality. The southern California farm with its twenty-five housing units, office and service buildings is no exhibition farm for the breeding and exhibition of fancy stock but a going concern, a potential industry, with a background of fifteen years' development.

Of course, the animals are not killed for their skins as yet. A pair of chinchillas are worth \$3,200 or more than their weight in

(Continued to page 174A)

TO EARN MORE MONEY • HAVE MORE FUN

Invest in PRACTICAL PROFITABLE Books



Whatever your interest—whatever your need—here are books that will help you. Popular Mechanics experts have selected them for you. Books to help you on your job . . . to help you to a better job . . . to help you earn extra money in spare-time work . . . to profitably develop a hobby . . . to gain advancement through home study. Other books for entertainment and recreation.

Successful businesses . . . profitable sidelines . . . doubled incomes . . . have resulted from a single idea. Popular Mechanics Books are filled with money-making ideas. Select from the list on this page. Profit with the latest and best-proven facts—ideas and information.

SELECT FROM THIS LIST

AUTO POWER: A fine, practical book on winding auto generators and converting "Model T" and other units into 110 and higher voltages. \$1.00.

EASY-TO-MAKE TOYS: 67 varied and novel designs. Just the thing for the home workshop or a guide to an interesting small business. \$1.50.

BOAT BOOK: Just published! New edition with six additional boats. Build your own boat. Full directions and details for all types small pleasure craft. 312 pages. Illustrated. \$3.00.

DYKE'S AUTO ENCYCLOPEDIA: World's Greatest Auto Book. New 17th edition just out. Now more than ever before the only book for auto and shop mechanics. 1396 pages. 4,600 illustrations. Cloth. \$6.00.

MODERN RADIO SERVICING: This radio man's "Book of Knowledge," by Ghirardi, covers every phase of radio servicing today. 1,300 pages, 700 illus. \$4.00.

AIR CONDITIONING: By Riesbeck. The book of the hour in this big new field. Get started in America's next big industry with this new, authoritative work. 369 pages. Illustrated. \$3.50.

DIESEL HANDBOOK: By J. Rosbloom. The standard book on modern Diesel practice. Adopted everywhere for instructions in land, marine, locomotive, automotive, aero and portable services. 544 pages. Illustrated. \$5.00.

OUTDOOR SPORTS: The one book for out of doors folks. Covers everything, including homemade equipment. For young and old. 352 pages. 650 Pictures. Cloth. \$2.00.

SHIP MODEL: Build finest ship model of them all. Sovereign of the Seas. A real masterpiece. Detailed instructions, plans, etc. Authentic design. 180 pictures. \$1.00.

REWINDING SMALL MOTORS: Details of repair shop practice for rewinding all fractional horse power motors. \$2.50.

FURNITURE DESIGN AND CONSTRUCTION: Shows how to design and make tables, chairs, desks, lamps, shelves, candlesticks, etc. \$2.50.

CONCRETE: 1001 Ideas for Using. New Popular Mechanics book. Just out. Most complete on subject. Covers all newest phases. Beautiful color illustrations. \$5.00.

WOOD TURNING: A real course of instruction in this fascinating art. Starts with simple operations. Includes spiral turning and complete jobs. \$1.50.

PROSPECTOR'S HAND-BOOK: Tells what minerals to look for and where. How to locate, sample, test, appraise, mine and market; also prices. \$3.00.

HIGH SPEED DIESEL ENGINES: New practical book includes fuel injection, combustion systems, frames, cylinders, running gear, construction details. Clearly written. \$2.50.

200 TRICKS YOU CAN DO: By famous Magician Thurston. Explains 200 tricks the average person can easily learn and do. \$1.00.

STEEL SQUARE POCKET BOOK: A complete, practical and handy treatise on best methods of using carpenter's steel square. Pocket size. \$1.00.

PRACTICAL MECHANICAL DRAWING: For individual study, shop classes, trade and high schools. \$1.00.

MODERN ELECTRIC AND GAS REFRIGERATION: By Althouse and Turnquist. Covers entire field of installation, service and repair. 850 pages. 368 illustrations. \$5.00.

THE BOY MECHANIC: A Four Volume Library Every Boy Should Have. Think of it—4,000 things boys can and want to make. Single volumes (each complete in itself). \$2.00. Four volumes \$7.00.

BIRD HOUSES: Build to sell; easy designs, standard types, houses for many kinds of birds. \$1.00.

BOOK OF SMALL HOUSES (9x12): 256 Pages: Plans, costs, specifications, construction details for 115 small houses. 500 photos. \$2.00.

CHEMISTRY, PRACTICAL EVERYDAY: Make hundreds things daily use. 2300 formulas and recipes. New, practical, commercial. \$2.00.

DOG TRAINING: Home, stage, movies, etc. Dog lovers: Learn the experts' methods of training. Train your dog. \$1.50.

SHEET METAL WORKERS' MANUAL: A complete book of 15 sections covering every phase of sheet metal work. \$2.00.

V-8 FORDS: Cars, Trucks. Includes 1937 models. Construction, operation and repair. 700 pages. Illustrated. \$2.50.

MONEY MAKING FORMULAS: 1050 ways to start a profitable business right at home. Make quick selling products. \$1.25.

LATHE WORK (Metal): Drilling, threading. 2 volumes, comprising hundreds of valuable shop kinks. Illustrated. \$1.00.

LOG CABINS: Easy plans; build for profit. Valued Complete building instructions. Covers fireplaces. \$2.50.

POULTRY: Breeding, management. For those interested in making Poultry pay. Develop phenomenal layers. \$2.00.

ELECTRONIC TELEVISION: New, non-technical book of the hour. Get the "inside" on a new industry. 200 pages. Illustrated. \$2.50.

RADIO PHYSICS COURSE: New edition. 992 pages. 500 illustrations. All about radio explained step by step. \$4.00.

ELECTROPLATING: Practical book of modern methods. Includes zinc, cadmium, and chromium plating. Also copper, gold, alloys, other metals and metal coloring. \$2.25.

SHOP NOTES LIBRARY: 5 vol. 2000 Wonderful shop ideas. Volumes reprinted annually from Shop Notes section Popular Mechanics. \$2.50.

WIRING: Approved economy methods for homes, buildings. Standard up-to-date book meets every requirement. \$2.50.

2000 WAYS TO MAKE MONEY

A THOUSAND WAYS TO MAKE \$1,000: Tried and Tested Methods that Work—That You Too, Can Use. How hundreds of men made their first \$1,000 in their own business. \$2.50.

MONEY MAKING IDEAS: 1000 spare time ways to make money. Practical guide for young and middle aged men and women, students, boys, girls. \$1.00.

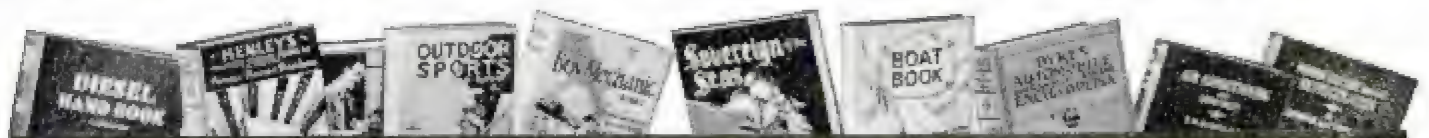


SEND NO MONEY—BOOKS SHIPPED C. O. D. IN U. S.

Select books from list above. Help yourself to more profitable—more enjoyable days. Send No Money. Pay postman above prices plus postage. (C.O.D. in U. S. and possessions only). Add ten cents for each book for postage if remittance is sent with order. Act Now.

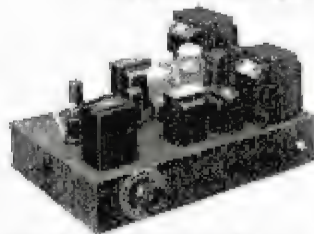
POPULAR MECHANICS PRESS

Room 237—200 East Ontario St., Chicago, Ill.



ATTENTION PLEASE

NOW YOU CAN MAKE YOUR OWN PUBLIC ADDRESS SYSTEM!



• It's easy to build a Jefferson sound-amplifier for your own pleasure, and for profit, too—renting it out for games, outings, parties, public meetings, skating rinks and dances.

Jefferson offers a wide choice of circuits from which to select, each incorporates the latest in radio engineering development. Catalog 372-R and manual of Easy-to-Build Amplifiers give

you complete information. . . . Decide now to enjoy the thrills of building your own sound system—rentals quickly return the original cost. Clip and mail the coupon now.

JEFFERSON ELECTRIC COMPANY,
Bellwood (Suburb of Chicago), Illinois,
Canadian Factory: 535 College St.,
Toronto, Ont.



JEFFERSON RADIO TRANSFORMERS

Jefferson Electric Company, Bellwood, Ill.
Please mail free Catalog 372-R and Amplifier Manual to:

Name.....
Address.....
City and State.....

Better POWER TOOLS AT Lower COST

Arcade Craft Tools give the home craftsman greater values than ever hoped for. Quality built for long service and accurate workmanship, yet prices are low. For example: Bench Saw with 11" x 14" table, \$11.00; Drill Press 15" high, \$5.30; Lathe with 8" swing, 30" between centers, \$9.50; Band Saw 10", \$18.00; Belt Sander 4" x 4" drums, \$8.00; Disc Sander 9" high, \$5.00; Jig Saw 15 1/4" high, \$5.30. Prices west of Rockies slightly higher. Write for FREE CATALOG illustrating complete line of Bench Tools, Model Makers and Accessories. If dealer cannot supply, order direct. Arcade Mfg. Co., 1219 Shawnee St., Freeport, Illinois.



NEW THRILLS and Scientific Knowledge for Experimenters



Now you can perform many amazing scientific experiments in the Control of Light by Polarization. With this newly developed POLARISCOPE you can reveal the gorgeous hidden colors of light in colorless crystalline materials, identify chemical crystals by their colorful patterns, demonstrate how auto driving will be made safe by preventing headlight glare, see how hidden depths in water are revealed by removing surface reflections, learn how invisible strains in glass are detected, and perform other miraculous feats with polarized light. All these Scientific wonders can be demonstrated with the new

SCIENCECRAFT POLAROID JUNIOR Experimenting Outfits

These Outfits contain materials, equipment, apparatus—including the newly developed SCIENCECRAFT POLARISCOPE—and instructions with which any Experimenter can perform hundreds of new, interesting, and educational experiments which demonstrate the latest development in the scientific world—the control of Light by Polarization!

Three Attractive Outfits
each including the SCIENCECRAFT POLARISCOPE
\$3.00 \$5.00 \$10.00

Ask for SCIENCECRAFT POLAROID JUNIOR Experimenting Outfit in your favorite store. If unobtainable, we will send your Outfit, fully prepaid, upon receipt of price.

FREE BOOK

of Home Experiments containing startling tricks and experiments you can do with materials found at home, also a Christmas Present Mystery and complete information about CHEM-CRAFT and SCIENCECRAFT Outfits.

The PORTER CHEMICAL COMPANY
4712 Prospect Avenue Hagerstown, Maryland

MARVEL LONG RANGE TELESCOPE

All distant objects, stars, ships, sports, airplanes, etc., closely seen through powerful lenses. Opens nearly 3 feet. Brass trimmings.



SPECIAL INTRODUCTORY OFFER. This wonderful \$1 value telescope will be sent postpaid for only
Satisfaction guaranteed. Order today.

The HOBBY MAN, 703 W. State St., (Dept. P. M.) Jefferson, Ia.

Neon Truck Signs

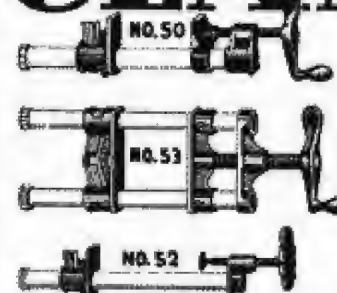
— NOW Possible with Amazing
New TRANSFORMER and Novel Method
of Tube Installation!

Old, established factory wants financially responsible business executives—to handle distribution in exclusive territories. Signs fill long-felt Advertising need! Enable any advertiser to have brilliant, colorful, attention-getting Neon Advertising message on trucks, both day and night. Expected to quickly sweep country! Easily installed on top driver's cab. Amazing NEW TRANSFORMER enables Sign to operate on any truck's standard 6-volt auto storage battery—using only about same amount current as an extra tail light. Novel method tubing installation protects against breakage. Reasonable capital handles exclusive Distributorship Contract. Big Profits. No sign experience necessary. We furnish entire product. FREE LITERATURE gives details, explains liberal proposition. Write today!

E. E. SOUTHER IRON CO., - - 1952-A-37 Kienlen Ave., St. Louis, Mo.

DISTRIBUTORS WANTED

CLAMPS



Clamping problems are solved with "Pony" Clamp Fittings for with ordinary pipe that you can pick up anywhere, anytime, for a few cents per foot, you can make clamps of any length. There's no size limit on what you can make—a cigarette box today, a desk-top tomorrow. Don't confuse with makeshift devices. . . . these are the standard (on pipe) clamps of industry with the patented Multi-Disc Clutch.

Fittings for 2 No. 50 Double Bar Clamps \$4.50 plus postage (10 lbs.)
Fittings for 2 No. 50 (3/4") Clamps \$3.00 plus postage (6 lbs.)
Fittings for 2 No. 52 (1/2") Clamps \$1.50 plus postage (4 lbs.)

ADJUSTABLE CLAMP CO.
"The Clamp Fella"
421 N. Ashland Ave., Chicago, U.S.A.

Write for Free Catalog

ExtraMoney From Books

SEND NO MONEY • Books Sent C.O.D. Anywhere in U. S. These famous Pay-Raising, Extra Money Books have helped thousands of others. Let them help you too. Check this list and mail with your name and address. Pay postman on delivery plus few cents postage. Send 3c stamp to cover postage and ask for catalog of other books.



SELECT FROM THIS LIST

ARMATURE WINDING
For A.C. and D.C. Machines.....\$2.00
AUTO REFINISHING
Duo With Spray Gun.....\$1.50
BLUEPRINT READING
For Machine Trades.....\$1.50
BRICKLAYING
Plans and Fancy.....\$1.50
CARBURETORS (All Makes)
New, Revised Edition.....\$2.50
CHEVROLET SIX
Car, Truck, Operation Repair.....\$2.50
COLONIAL FURNITURE
Making, 95 Pieces.....\$3.50
DANCE
Learn at Home Without Music or a Partner.....\$2.00
DIE CASTING
Machines, Dies, Alloys.....\$3.00
ELEMENTS DIESEL
Engineering Questions and Answers.....\$4.00
FOUNDRY WORK
Molding, Casting, etc.....\$2.00
FURNITURE REPAIRING
Finishing and Decoration.....\$3.00
HEATING, VENTILATING
Homes and Buildings.....\$2.50

HIGH-SPEED DIESELS
New, practical, non-technical.....\$2.50
INVENTIONS
1500 Needed.....\$2.50
LEATHER MAKING
and Home Tanning.....\$1.00
MACHINE SHOP WORK
Tools and Methods.....\$2.50
MAGICIAN'S MANUAL
New, 100 Tricks for Amateurs.....\$1.39
METAL SPINNING
Practical New Book.....\$1.00
MONEY MAKING FORMULAS
10,000 Practical.....\$4.00
MOTOR VEHICLE
Trouble Shooters' Handbook.....\$2.00
PLASTERING
Best Instruction Manual.....\$1.25
RADIO PHYSICS COURSE
New edition. Everything about Radio.....\$4.00
SHEET METAL
Construction Work.....\$2.00
STEAM ENGINEER'S LICENSE
How to Obtain.....\$2.00
STEEL SQUARE
Hodgson, 500 pp. 300 illustrations.....\$2.00
TAXIDERMY, HOME
Mount Trophies Profit, Pleasure.....\$1.50
WROUGHT IRON WORK
Practical.....\$1.35

POPULAR MECHANICS PRESS

Room 1137A 200 E. Ontario St., Chicago

SELF-GENERATING JIM DANDY ALCOHOL BLOW TORCH



**4 INCH FLAME
1000 USES IN SHOP AND HOME**

Operates under any conditions—inverted or upright position—always SAFE! Self-generating, throws a maximum blast flame of 2200 Fahr. A CLEAR FLAME without film.

Ideal for Soldering, Welding, Smelting, Brazing, Paint removing, Laboratory work, drying and patching cement or plaster, THAWING FROZEN PIPES and RADIATORS, etc. Use for general repairing, fusing, CAMP COOKING and all kinds of electrical, mechanical and automotive repair work. Exclusive PATENTED features including extended handle—always cool, holds auxiliary fuel supply. FAST PRIMING, easy to operate! Send for yours today. An ideal gift for the mechanic or home craftsman.

**\$2.00
POST PAID**

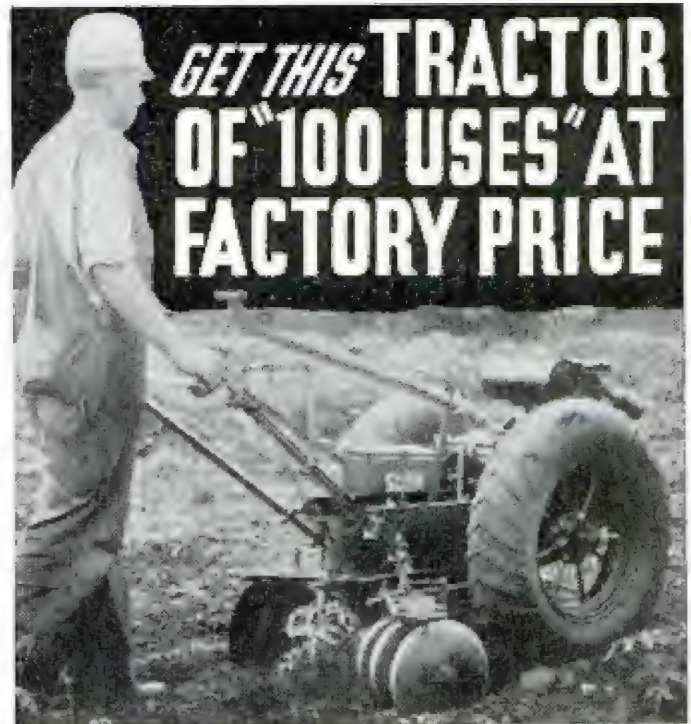
Full guarantee sent with each Torch

STARRETT PRODUCTS CO.
53 State Street, Boston, Mass.

Enclosed find \$2.00 for which please send me your No. 675 JIM DANDY Blow Torch, Postpaid.

Name
Street
City State

For smaller jobs the JIM DANDY No. 80—Self Blowing Torch with pointed flame, maximum heat 1400 Fahr. Will be shipped postpaid ONLY \$1.00.



GET THIS TRACTOR OF "100 USES" AT FACTORY PRICE

DOES WORK OF MANY MEN OR 2 HORSES!

Here's untiring speed and power—that gets field and belt work done on time! Smallest size does work of many men—saving wages, larger sizes do work of 2 horses or mules—quicker, cheaper, more efficiently—saving costly animal keep. Runs all day for 33c. Greatest time, labor and money-saver model.

"Tractor of 100 Uses"—Does all field, road, belt work. Plows, discs, harrows, furrows, seeds, cultivates, harvests, mows, rakes, cuts tall weeds, hauls. Runs washing machines, feed grinders, corn shellers, light plants, saws, concrete mixers, water pumps, lathes, other belt machinery. Does deep mold-board plowing, other heavy work. Amazing money-maker for farms, truck gardens, nurseries, orchards, suburban homes, golf courses, parks, etc.

SHAW GARDEN TRACTOR

New 1937 Model Has 3 Speeds Forward, and Reverse. Special to Order, 6 Speeds Forward—runs from $\frac{1}{4}$ mile to 15 miles per hour. New Power Turn enables Shaw to turn in its tracks with no lifting or pushing. Reverse Gear makes it easy to work among rocks, roots, in close quarters. Tool Attachments for different uses. Convenient Jiffy Hitches. Improved Tool Control gives tools a wider range of movement... increases tractor's usefulness. Briggs & Stratton air-cooled, 4-cycle engine 4 Models, 2 to 5 H. P., Walking and Riding Types.

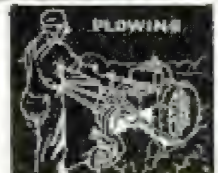
Available With Air or Steel Tires. Air tires save 25% fuel. Enable Shaw to do more work in a day. Provide better traction.

LOW FACTORY PRICE!! Mail Coupon for details of price and terms today!

10-DAY TRIAL FREE BOOK!

OFFER! Use on your own work for 10 days. Know how Shaw makes you much more money—with less work and trouble! Mail Coupon for details 10-DAY TRIAL OFFER today!

Explains everything about Shaw. Tells what enthusiastic owners say. Shows photos of tractors in use. Gives LOW Factory Prices on 4 different size models—with different attachments. Mail Coupon today!



AGENTS
—wanted. Liberal proposition. Mail Coupon for full information.

FREE BOOK COUPON

THE SHAW MFG. CO. (Address Nearest Office)

4512 Front St., Galshburg, Kans.; 5812-G Marmella Street, Chicago, Ill.; 130-G West 42 St., New York, N. Y.; 468-G No. Fourth St., Columbus, Ohio.

Send me FREE information at once about the Shaw "Du-All" Garden Tractor as checked below:

☐ FREE Book and Low Factory Prices ☐ 10-Day Trial Offer ☐ Liberal Agent's Proposition

Name

Address

Town State

Welcome Gifts FOR ANY "HIM"



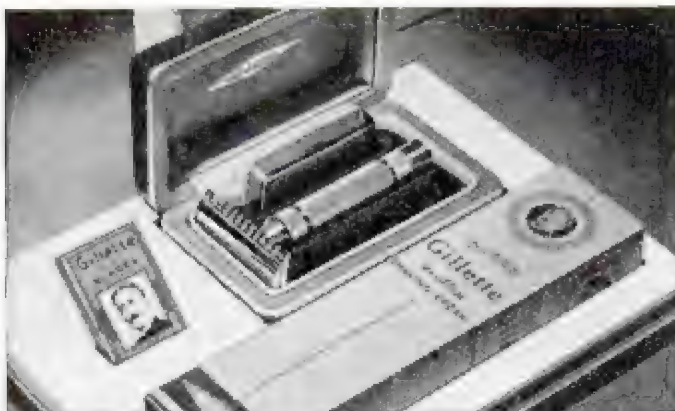
This year give him—any "him"—old enough to raise a beard and wield a razor—months of matchless shaving comfort. Select one of Gillette's new, brilliantly styled Gift Sets and his "thanks" will

be wholehearted—sincere! There are six of these fine shaving kits, priced from 98¢ to \$7.23. Each includes a handsome, gold-plated Gillette Razor and a generous supply of super-keen Gillette Blades. All but one also contain a tube or two of Gillette's amazing new Brushless Shaving Cream—made with peanut oil. Ask your dealer to show you these colorful Christmas packages—attractive to eye and pocketbook alike.

GILLETTE SAFETY RAZOR CO., BOSTON, MASS.



Gillette Red and Black Package (No. 1) has handsome, gold-plated Gillette Razor in sturdy traveling case, and 15 Gillette Blades. An exceptional value at only 98¢.



Gillette Bostonian (No. 2) includes gold-plated Gillette Razor in attractive traveling case, and 10 Gillette Blades. Also a tube of Gillette Brushless Shaving Cream. \$1.39.

Gillette

GIFT SETS

25 1096

(Continued from page 170A)

gold. At present the animals are being sold to big-time breeders who are setting up their own farms with an aim toward supplying the fur markets with chinchilla a few years hence.

Let's look in on the chinchilla in its California home. Cages with wooden floors and fine mesh wire sides are arranged in rows. They are so constructed as to keep out all rats, snakes, and other pests that might cause a sharp drop in profits by a single night's work.

Inside these cages are scientifically constructed boxes, approximately two by two by three feet with an indirect entrance near the top. These serve as the chinchilla's home, one to a cage. Since he is not given to burrowing, heavy walls are not required to contain him. In captivity, the chinchilla sleeps during the daytime and around sunset comes out to feed and exercise. Clean and dainty, the animal is easily tamed and has no vicious traits.

The chinchilla is strictly a family man and once he finds his mate they share the same cage for the rest of their lives, which is sometimes more than twenty years, according to Chapman. There are from one to three litters per year, with one to four babies per litter, an average of slightly less than two per litter. Chinchillas mature and mate at about one year, although some breed at six months. It is an interesting fact that the babies are born with their eyes open and within an hour after birth they are up and scampering around.

The little rodents have bird-like appetites and their yearly board bill for a varied ration of whole grains, commercially prepared pellets, alfalfa hay and a variety of fresh green vegetables is negligible.

Since the farm was started, breeding records have been accurately kept and it is possible to tell the lineage of any animal. For purposes of identification, every animal has a number tattooed inside the ear.

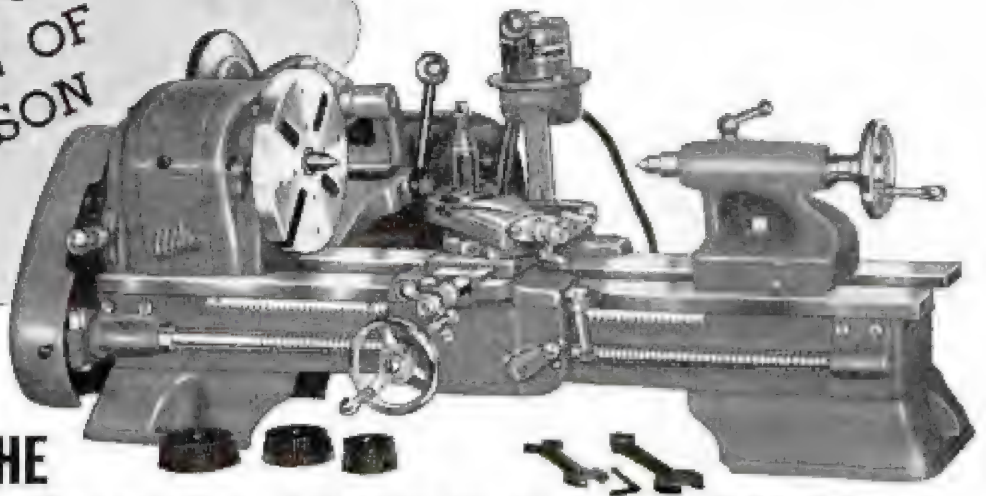
While there are no specific infectious diseases from which chinchillas suffer every precaution is taken against contagion. A well-equipped laboratory is maintained for treating the animals.

If, a few years hence, you have occasion to see the style leaders of the world swathed in chinchilla coats, you will know that Chapman has drawn aces in the greatest fur gamble in history.

IT'S THE
MACHINE TOOL
SENSATION OF
THE SEASON

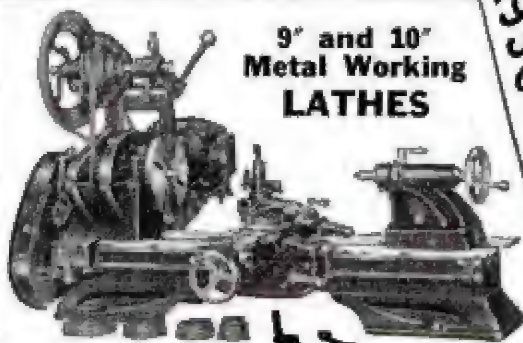
Atlas

New Small
Metal Working LATHE



Machinists, model makers, jewelers, home craftsmen—they're all talking about this amazing new lathe. You will, too, when you see it. All the famous features of the larger Atlas lathes are right here for you in this small deluxe model. It's a back-geared screw-cutting lathe with 16 speeds, reversible power feeds, integral countershaft, V-belt drive,

Timken bearings, and many other features. There are two sizes—12" and 18" between centers—6" swing. **Prices are only \$59.50 and \$64.50**, complete less motor. There's never been a value like this before. Ask your dealer to show you this sensational new Atlas, or send the coupon below for complete information.



**9" and 10"
Metal Working
LATHES**

The most modern bench lathe. Everything you need and want for precision work and easy operation. Many extra exclusive features. \$59.50 to \$122.50.

DRILL PRESSES

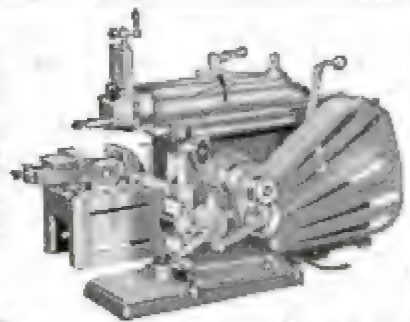
4 sizes and prices to fit every need. New Atlas ball bearing spindle construction assures greater accuracy and longer life. \$17.75 to \$45.75.



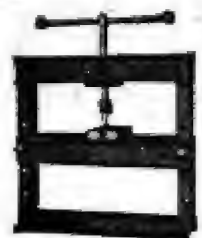
WOOD LATHES Deep grooved SKF ball bearings assure long, accurate service at high speeds. \$24.95 to \$33.95.

**New! Precision
BENCH SHAPER**

All the precision and power of large machines built down to scale. 7" stroke, 4 speeds, 5 surface feeds in either direction. \$215.00 with guards.



**MOTORS &
GRINDERS**
\$10.25 and up



**ARBOR
PRESSES**
\$13.25 and up

1938 Catalog Ready—Write Today

ATLAS PRESS CO.
1243 N. Pitcher St., Kalamazoo, Mich.
Kindly send me your new 1938 Catalog.

Name.....

Address.....

City and State.....



ATLAS PRESS CO.

1243 N. PITCHER STREET
KALAMAZOO, MICHIGAN

CHICAGO 35 E. WACKER
AT WABASH

FACTORY DISPLAYS AT
NEW YORK 138 WEST
42ND ST.

PHILADELPHIA 113 N.
3RD ST.

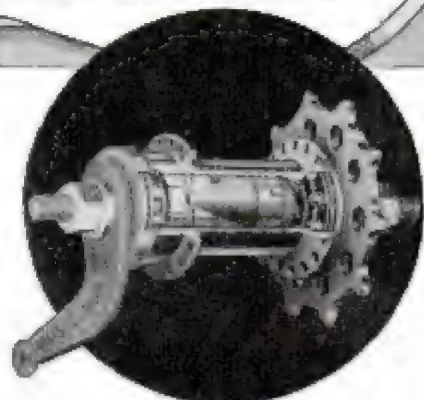
LATHES • DRILL PRESSES • ARBOR PRESSES • SHAPERS



I don't mean that I hope you get a good "break" with a pile of gadgets around the Christmas tree. I hope you get a good *brake* this Christmas. The *brake* is more important than the bicycle, Ted. I'd rather have any old bicycle with a good *Musselman Cartridge coaster brake* than a swell looking bike with an old-fashioned brake.

*MUSSELMAN CARTRIDGE BRAKE

Remember that name, *Musselman*. It is the simplest coaster brake made. Why, it pedals so easy, it seems like going down hill most of the time and you should see how much farther my bike coasts with the *Musselman* brake. It's right there when it comes to stopping, too. Stops as quick as lightning and it does not throw you off the seat, either. See that you get the new *Musselman Cartridge coaster brake* on your bicycle for Christmas. It costs no more than the old-fashioned kind. Drop us a letter or post card today for beautifully illustrated folder showing Johnny Weismuller, World's Champion Swimmer, riding with a *Musselman* brake, and the story of the famous Pike's Peak ride.



THE REPLACEABLE CARTRIDGE UNIT

MUSSELMAN HUB BRAKE CO. 6220 St. Clair Ave.. CLEVELAND, OHIO

NEW! DIFFERENT Wrist Action CORD SET MONEY MAKER.

**Women ARE GOING
WILD ABOUT THIS
NEW WRIST-ACTION CORD!**

Here is no ordinary new product. This new Wrist-Action Plug is one of the most remarkable new devices ever offered in the Direct Selling Field! You never saw anything like it. Housewives are fascinated—held spellbound by the instant demonstration you can give with this new electric iron cord that swings freely in any direction. Ends kinking and twisting—prevents broken wires, burned fuses. Swivel action plug spins round and round—swings from side to side—keeps cord out of the way—no wonder housewives say, "Just what I want," as soon as they lay eyes on it!

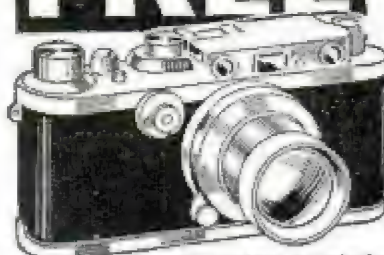
FREE Sales are instant—sure! Nothing like it ever before. Here is the self selling big money maker you can clean up with. Get the story at once. Learn how you can get your own DEMONSTRATION FREE. All territories virgin—wide open. Write immediately for sensational money making plan.

NO-TRO ELECTRIC APPLIANCE CORPORATION

820 W. Erie St. Dept. P-12 Chicago, Ill.



FREE



Choose from America's most complete, varied stock—from world's leading makers: Eastman, Zeiss, Bell & Howell, Graflex, Korona, Bausch & Lomb, etc. 10 Days Trial—Satisfaction Guaranteed. (Your camera, equipment taken in trade.) Write for Free Camera-Catalog NOW!

**CENTRAL Camera Co. (EST. 1899)
230 S. Wabash, Dept. K-12, CHICAGO**

CAMERA BOOK!

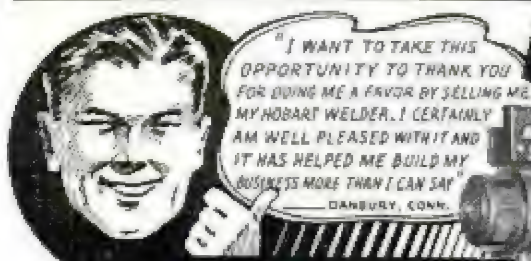
Offers hundreds of money-saving bargains in Still and Movie Cameras, Lenses, Films, Enlargers, Exposure Meters, Dark-room Supplies—everything photographic.



GIVEN AWAY!

You get one—Your friends get one—without cost. Let us give you the details of this amazing Radio Gift Offer. Also it can pay you big money giving it away free. Nothing to buy or sell. Write fast!

**A. D. BERNHART
Dept. 1212
6227 Broadway, Chicago, Ill.**



"I WANT TO TAKE THIS OPPORTUNITY TO THANK YOU FOR DOING ME A FAVOR BY SELLING ME MY HOBART WELDER. I CERTAINLY AM WELL PLEASED WITH IT AND IT HAS HELPED ME BUILD MY BUSINESS MORE THAN I CAN SAY."
DANBURY, CONN.

SIMPLIFIED ARC WELDING BRINGS BIG PROFITS EVERY MONTH

New low prices make this profitable welding service available to everyone. Opens doors to big pay jobs that carry real profit. Hobart welders are easier to operate, faster, guaranteed to bring you quality welding business... extra profits will pay for welder without increase to you.

NO INVESTMENT TERMS—PROFITS PAY FOR IT Extra margins and savings possible with Hobart Welders make it easy to own without expense. Write for details.

HOBART BROS., Box M-127, TROY, OHIO



The New Industrial Revolution..

Aided by Low Cost Precision Tools Which YOU, Too, Can Own

A vital industrial change has occurred in this country during the last ten years. Large production plants, ordinarily associated with only heavy production equipment, have installed batteries of low-priced motor-driven units—thus achieving greater flexibility, and lower costs. Light manufacturing plants, for greater economy and increased efficiency, are utilizing more and more this new type of motor-driven tool. Building contractors and small shop owners have eagerly adopted low-cost motor-driven units to replace slow, costly hand operations. At a fraction of the cost of heavy equipment, schools have installed complete shops of individual, accurate, convenient machine tool units. Home work-shop owners by the tens of thousands have turned to "power tools" to eliminate tedious hand operations—and open new fields to spare-time craftsmanship.

NEW 1938 DELTA TOOLS

In the vanguard of this industrial revolution, and an important factor in making it possible, are Delta "Quality" Tools. Delta engineers have pioneered numerous basic improvements in motor-driven tools—beginning with the self-contained "unit" idea and including the first really efficient modern scroll saw, the new type low-cost drill press and the radically improved band saws, circular saws, shapers, sanders, grinders, jointers, mortisers, lathes that are the accepted standard of quality the world over. In almost every country in the world—Delta Tools are quietly, efficiently, consistently demonstrating that good tools can be produced at low cost!

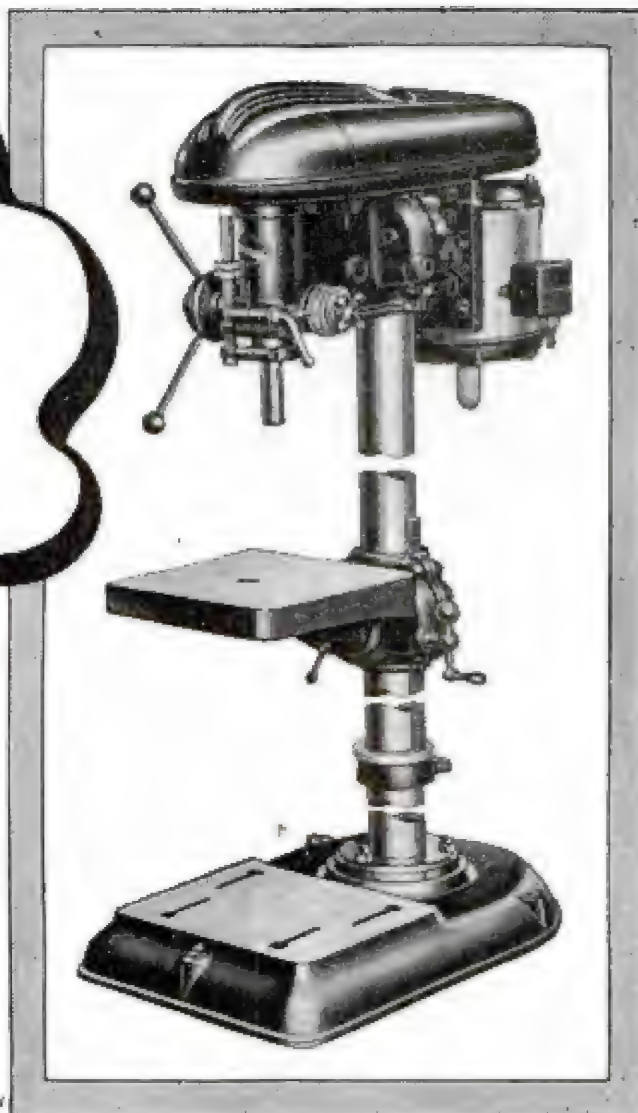
SEND FOR CATALOG

The 1938 Delta Catalog is the guide book to modern motor-driven tools. Send coupon for your copy—and the latest Delta Project Book No. 4—packed full of new and different things to make, with many photographs, working drawings, and complete instructions. Enclose 10c for Project Book. Catalog will be mailed postpaid.

Delta Manufacturing Company
600-634 E. Vienna Ave. Milwaukee, Wisconsin

Delta

QUALITY TOOLS



THE 17-INCH DRILL PRESSES—the greatest drill press values ever offered. Incorporating numerous exclusive features, including Floating Drive, Pre-loaded Double-Seal Ball Bearings, 16-Tooth Splined Spindle, Tilting or Production Table, Safety Spring Wind, Foot Power Feed. Heads for these drill presses can be purchased separately.

14-INCH DELTA DRILL PRESSES. Thoroughly tested by years of the hardest work in industrial shops of all kinds, Delta 14-inch drill presses are still leaders in this field. This year's models are further refined and improved, including the adoption throughout of the new internal-gear clutch inside the spindle pulley, which automatically insures perfect alignment. (Patented).



★
METAL-CUTTING BAND SAW. It takes the place of a power hacksaw in cutting off bars and shapes; it is used in the tool-room for sawing off tool, die and fixture stock; it will cut uniform strips from sheets; it saves hours of time in cutting templates and similar tools, and will cut almost any material, such as asbestos, mica, vulcanite, fiber, etc. Four low metal-cutting speeds and one high speed for wood sawing.



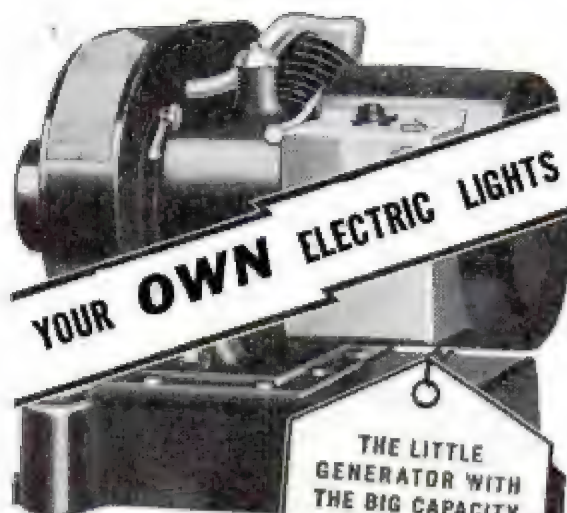
DELTA MANUFACTURING CO., Dept. A1237
600-634 E. Vienna Ave., Milwaukee, Wis.
I enclose 10c (stamps or coin) for which please send me one copy of the new 1938 Book No. 4 of "Practical Delta Projects." Also place me on your mailing list to receive 1938 Delta catalog of quality motor-driven wood-working tools.

Name

Address

City..... State.....

☐ Check here if you are a Delta user now.



YOUR OWN ELECTRIC LIGHTS

THE LITTLE
GENERATOR WITH
THE BIG CAPACITY
300 WATTS
12 VOLTS

\$69.75
F.O.B. FACTORY

The new Iron Horse Generator brings electric lights within the reach of all! Engineered for high performance at minimum cost. Lights twelve 25-watt lamps at once! Charges batteries. Powered by the famous Iron Horse 4-cycle gasoline engine—the last word in modern design. Push button starting. **DEPENDABLE!**



FREE! Write for valuable booklet of working plans and detailed diagrams on wiring your home for low cost electric light operated from your own plant.

JOHNSON MOTORS

2030 Pershing Road Waukegan, Illinois

JOHNSON IRON HORSE GENERATOR

FREE!

**LABORATORY APPARATUS
BIOLOGICAL SUPPLIES
MICROSCOPES
TELESCOPES
CHEMICALS**

New complete 32 page catalog lists hundreds of items of interest to amateur and professional experimenters. Save Money—Buy Direct. Send now! It's FREE and contains full of bargains and valuable information.



J. H. WINN MFG. CO., Dept. 412, 124 W. 23 St., New York

**WORLD'S GREATEST all around
ELECTRIC TOOL**

**SENTON
30 DAYS
APPROVE**

The new WHIZ ELECTRIC TOOL is the handiest, most useful power tool ever made. Not a delicate instrument but a real rugged tool, equally effective for both power and precision work. Drills through 3/4 inch iron plate in 42 seconds or engraves intricate designs on jewelry. Uses 50 different accessories, instantly interchangeable. Handles any material: Metals—Woods—Alloys—Plastics—Glass—Steel—etc. Saves time. Eliminates tedious labor. PERFORMS JOBS IMPOSSIBLE WITH OTHER TOOLS. Plug into any socket AC or DC, 110 volts. Chuck 3/8" capacity. Ball bearing thrust. Powerful, triple-neared motor.

**ONLY
\$6.95
POSTPAID**

FREE! Accessory outfit including set of drills, mounted 1 1/2" grinder, cutting wheels, sanding discs, mandrel, mounted brush, etc. (REGULAR VALUE \$2.00) FREE with each outfit ordered.

PARAMOUNT PROD. Co., Dept. 12-A, 245 Broadway, New York

XMAS MONEY FOR YOU..

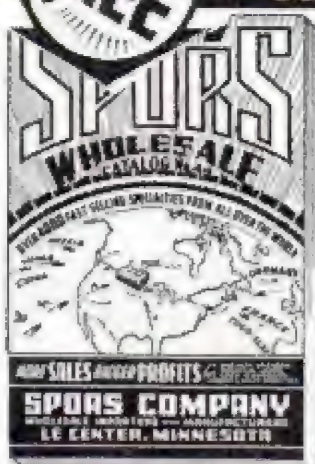
There's a big demand for the many hand-tooled articles you can make with the Esaco Leathercraft Set. Easily learn to make good money in your spare time. Complete outfit including tools, leathers, patterns, etc., and full instructions, only \$2.00—on sale at leading Department Stores, or order direct and pay postman on arrival.

LEATHERCRAFT

Free When ordering direct, clip name of your Department Store to this ad, and we will include with your set, one extra free project. Illustrated catalogue 10c.

E. A. SWEET CO. Dept. A-7 Binghamton, N. Y.

WHOLESALE CATALOG
of 4000 FAST SELLERS



Has 260 pages of World Wide Bargains. 4000 Bargains' specialties, 15 new selling plans, 30 money making ideas. Hundreds of selling propositions, new creations, outstanding values—at salesman's rock bottom wholesale prices. This catalog is free, send for your copy. Today. (Below are 2 of the thousands of unusual values, offered by the House of Spurs).

**GUARANTEED
FOR LIFE PEN**

No. R317 Pump filler, fountain pen. Cleans, fills and empties in one operation. Fitted with new, improved, slip-resistant, rubberized, non-slip, pen holder. Has visible ink supply—holds 3 times more ink than ordinary fountain pen. Comes in popular pearl-effect colors. Guaranteed to satisfy or money back. Suggested Selling Price \$10.

Sample 30c Dozen \$2.80

WIND-PROOF LIGHTER

No. M32. A shielded flame at the press of a thumb. Has perforated "chimney," which protects the flame from wind. Just the thing for hunting, fishing, golfing, automobilists or where a shielded wind-proof flame is desired. Suggested Selling Price \$10.

Sample 20c Dozen \$1.25

SPURS CO., 10-37 Main St. Le Center, Minn.

**WESTINGHOUSE UNIVERSAL
MOTOR 1/30 H. P. operates on 110 volt,
AC or DC, 5000 RPM. \$2.55
plus 25c Postage. Arbor and
1/4" Chuck \$1.00 Extra; 3/4"
Pulley—25c. Send Check or
Money Order. Money back guarantee.**

**NATIONAL ELECTRIC TOOL CO.
560 Washington Chicago, Ill.**

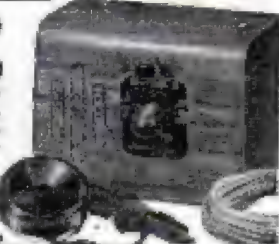


TEE-NIE RA-DI-O

**MARVELOUS RECEPTION—No \$2.00
Tubes! No Current! Use Anywhere!**

New! Patented! Guaranteed! For Complete standard broadcast band, sports, music, favorite programs. Clear, natural tone. New "superior" magnet! headpiece, patented "hot spot" crystal. Simple to use. Set is complete. Ready to use anywhere. Get yours now. Price may vary. Send \$2.00 post. or post postage 10 day MONEY BACK TRIAL. Order TODAY! Ideal Xmas Gift.

UPPER MFG. CO., 1862 Tilden St., Chicago



STRIPE YOUR OWN CAR

Anyone can stripe a car with an automatic ROLL-A-STRIPE. You can save the price of your striping job and earn money doing others. Specially knurled roller and dependable gauge. Paint, lacquer, enamel or varnish may be used. Stripe signs, furniture, models, etc. See any Dues Dealer today or send direct. Postpaid \$1.50.

MODCRAFT INDUSTRIES, Dept. P-32, 2908 N. Nordica Ave., CHICAGO, ILL.



**TRAILER PARTS AND EQUIPMENT
for building any type of trailer.**

WRITE FOR FREE LITERATURE.

HAMMER BLOW TOOL COMPANY, Dept. 112

WAUSAU,

WIS.

When writing please mention Popular Mechanics

NOW YOU CAN GET A... HEAVY DUTY INDUSTRIAL WELDER

**WORKS ON 110-VOLT
Electric Light CIRCUIT**

At this unheard of price, you can get this marvelous DYNAMIC Super-Charged Welder—this welder is a radical departure from accepted welding practices. It will do the work of much higher priced types—efficiently cooled—light of weight—easily portable. Will solder and braze on the lightest material. Works on iron, steel, tin, brass, copper and all other metals.

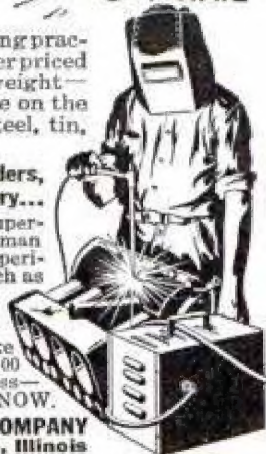
WELDS Cylinder Blocks, Bumpers, Fenders, Tanks, Farm Machinery...

AGENTS

Make big profits selling to garages, factories, janitors and machine shops. Write TODAY and ask for our 10-DAY TRIAL OFFER.

With this Dynamic Super-Charged WELDER, a man without previous experience can make as much as \$5.00 on a repair job that can be done in less than one hour. Many welding operators make as much as \$15.00—\$20.00 a day—Go into business—Open a Welding Shop NOW.

DYNAMIC WELDER COMPANY
2225-AW Silverton Road, Chicago, Illinois



EARN MONEY at Home

Make delicious, new "NON-GREASY" Potato Chips at low cost. We furnish equipment and instructions. Potatoes plentiful and cheap. Groceries, markets, restaurants, taverns do the retailing for you. Profit large—unusually so. You can start this money-making business on a "next to nothing" outlay of cash. Write for Potato Chip Booklet.

LONG-EAKINS CO.,
1228 S. High St., Springfield, Ohio



TRAILER

DESIGNERS
BUILDERS
TRAVELERS

TRAILER
PLANS

SEND 25c TODAY FOR this big 68 page Trailer Manual printed in color. It is chock full of builders' information—Over 350 illustrations, 500 exclusive Trailer supplies, equipment and accessories needed to build the most modern Trailer. **BUILDERS GUIDE** with complete plans, instructions, designs, specifications, listing practical material. Trailer cabinets, stoves, refrigerators, sinks, water tanks, cushions, table, drawers, bathtubs, toilet, etc. Also a complete Trailer shell built into 10 sections ready to set up and bolt together. Takes low freight rate. Send 25c, coins or stamps today.
A.J. Stephens & Co., 2805 E. 14th St., Kansas City, Mo.

EASY to SELL MACHINERY!

BE OUR REPRESENTATIVE!

Contact dealers and factories in your community. Liberal commissions on every order. Stoves, machinery, electrical appliances, electric razors, movie equipment, etc. New field, tremendous opportunities—no investment. Write for big catalog and full details.

Republic Machinery Sales Co.
900 W. Jackson Blvd., Chicago, Ill.



SEND for CATALOG and PLAN



Get this
Book Now!

MONEY MAKING FORMULAS

1059 PRICELESS FORMULAS ALL IN ONE BOOK FOR \$1.25

**FORTUNES MADE WITH
FORMULAS LIKE THESE**

Cosmetics Remedies Beverages Paints Glues Polishers Inks Soaps
Fertilizers Preservatives Lubricants Auto Products Food Products Metal Products, Etc.

Hundreds of big selling products—earning millions in profits—grew from a simple formula. Your own product may bring you fame and fortune. Get this big 200 page book with 1059 formulas, and start a spare or full time business of your own. Everything explained—what to make—how to make it—where to get materials. This is the book that lifts the veil of secrecy from a profitable and fascinating business. Get your copy now. Only \$1.25 postpaid.

Popular Mechanics Press, Dept. 1237-B, 200 East Ontario St., Chicago

Where There's Food - You'll Find Game!



SPORTSMEN are placing their faith in this basic principle of game restoration—"Where there's food, you'll find game."

In one section of Illinois, sportsmen and landowners have planted more than 400 food patches for game. Similar interest in better hunting is apparent everywhere! It is part of the WESTERN-WINCHESTER Game Restoration Plan—prepared for YOU by experts. Thousands have enrolled... Mail the coupon for "UPLAND GAME RESTORATION" and instructions on HOW to apply the plan to your hunting area.



FREE BOOKLET—"UPLAND GAME RESTORATION"

WESTERN CARTRIDGE COMPANY,
Dept. L-46, East Alton, Illinois.

Please mail, FREE, your 68-page booklet "UPLAND GAME RESTORATION," a complete textbook of game management.

Name

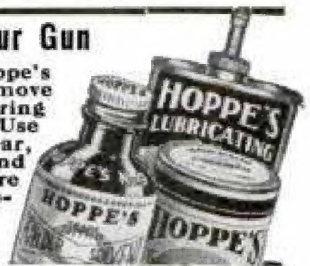
Address

Post Office State

Get HOPPE'S To Protect Your Gun

KEEP it in best condition. Use Hoppe's No. 9 and Hoppe's Patches to remove bore leading or metal fouling, all firing residue, and to prevent rust. Use Hoppe's Oil to lubricate, prevent wear, clean and polish. For trial No. 9 send 10c, Oil 15c, Patches 25c—give bore size. Free valuable booklet on Protecting Shotguns and Rifles.

Frank A. Hoppe, Inc.,
2327 N. 8th St., Phila., Pa.



SPORTOCULARS \$198

FULL SIZE, Sturdily Constructed Field glasses that wear like spectacles. Enjoy "front seat view" all sporting events indoors and outdoors. Powerful lenses—light weight yet strong—Beautifully finished. Separate eye focus and width adjustment. Sent postpaid for \$1.98 or C.O.D. plus postage. Money Back Guarantee.

HILL-VIOLIN CO., Dept. 241
5248 Drexel Ave. Chicago, Ill.



**WIDE VISION
ADJUSTABLE**

Manheim POCKET SLIDE RULE



With A-B-C-D Scales. Multiplies, divides, squares, takes square root, finds circumference and area of circles, 8 inches long—thin construction. NO WOOD OR CELLULOID. Fits in vest pocket. Send \$1 in cash, money order or check (\$1.25 Canada and foreign countries) and receive slide rule with genuine leather case and instructions. Box M-14.

M. MANHEIM COMPANY, Inc.

15 E. 26th St.

New York, N. Y.

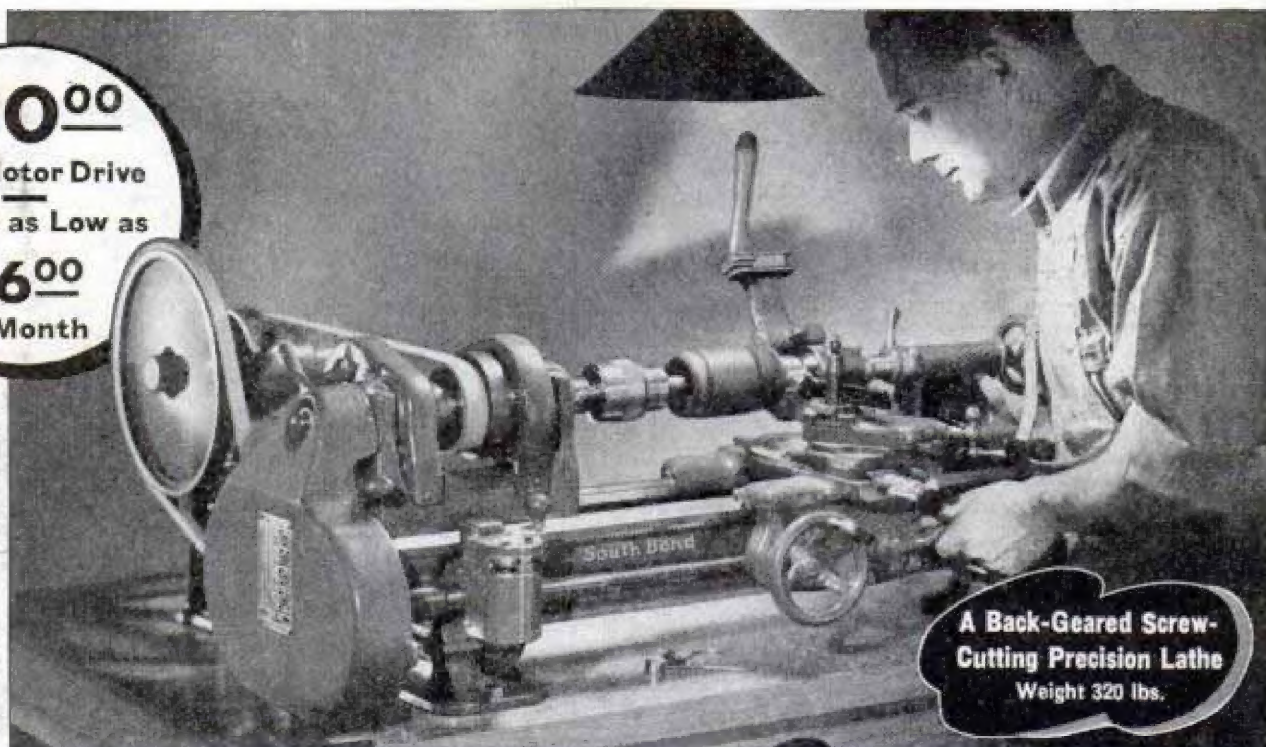
\$90⁰⁰

Less Motor Drive

Terms as Low as

\$6⁰⁰

a Month



A Back-Geared Screw-Cutting Precision Lathe
Weight 320 lbs.

9" x 3' *Genuine* SOUTH BEND WORKSHOP PRECISION LATHE . . . On New Low Terms

No. 415-YA, 9 $\frac{1}{4}$ " swing by 3' bed Workshop Bench Lathe with Horizontal Motor Drive, $\frac{1}{4}$ H.P. Reversing Motor, Switch and Adjustable Belt Tension Countershaft.

\$122⁰⁰

(**\$15.00 down, \$6.00 a month for 18 months**)

The 9-inch Workshop Lathe is a Precision Lathe with Back Gears, large V-ways on lathe bed, a Precision Lead Screw for cutting screw threads, and is designed to handle the finest, most accurate jobs in manufacturing—in the tool room, in home workshops and automotive machine shops. Workmanship and materials are the same as in our larger, more expensive models, representing the greatest value we have offered in 30 years of fine lathe manufacturing.

Features include Twin Gear Reverse to lead screw, Ball Thrust Bearing on Spindle, Automatic Longitudinal Screw Feed to Carriage, Precision Lead Screw for Cutting screw threads from 4 to 40 per inch, $\frac{3}{4}$ -inch hole through spindle taking collets up to $\frac{1}{2}$ -inch capacity. Takes 38 attachments for milling, grinding, draw-in Collet chuck work, and many other jobs.

FIVE OTHER SIZES

South Bend Precision Lathes are manufactured in 9", 11", 13", 15" and 16" swing, in bed lengths from 3' to 12', in both Motor Drive and Countershaft Drive.

Write FOR THESE BOOKS

Latest and most authoritative instruction on lathe practice and operation. "How to Run a Lathe" has 160 pages with over 300 illustrations showing every type of work done on a lathe. Over 1,500,000 copies already sold. Priced at 25c each. New Catalog No. 15-Y illustrates, describes, and prices the 9-inch Workshop Lathe in 8 different drives and 4 bed lengths. Copy sent free postpaid.

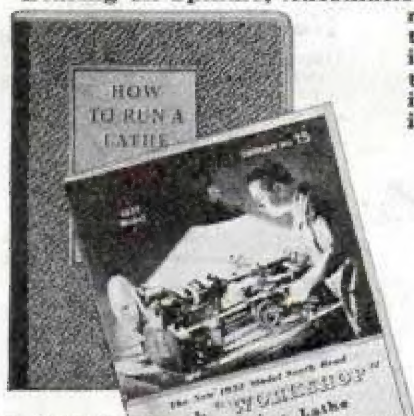
LATHES for the MACHINE SHOP, MANUFACTURING PLANT and TOOL ROOM



SYNTHANE CORPORATION
Oakes, Penn.
14 South Bend Lathes in Use



SCINTILLA MAGNETO CO., INC.
Sidney, N. Y.
17 South Bend Lathes in Use



South Bend Lathe Works,
624 E. Madison St.
South Bend, Ind., U. S. A.

Please send me the following:

- ☐ No. 33LB "How to Run a Lathe," 25c
☐ No. 15Y 9" Workshop Catalog, Free
☐ Easy Payment Purchase Plan

Class of Work.....

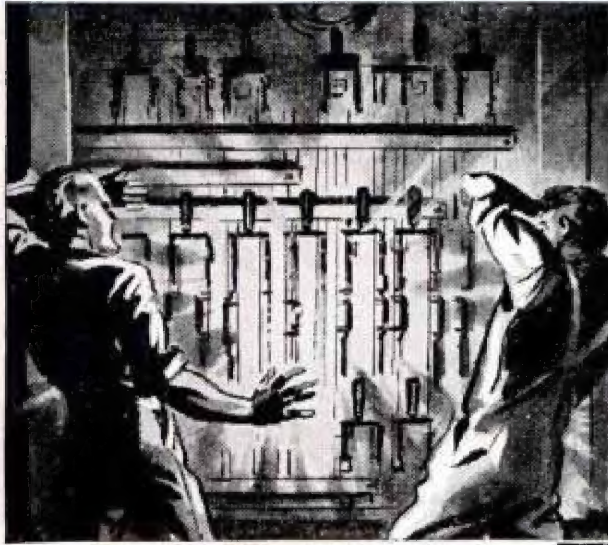
Name.....

Address.....

City..... State.....

SOUTH BEND *Precision* LATHES

Panic Loomed...The Show Went On!

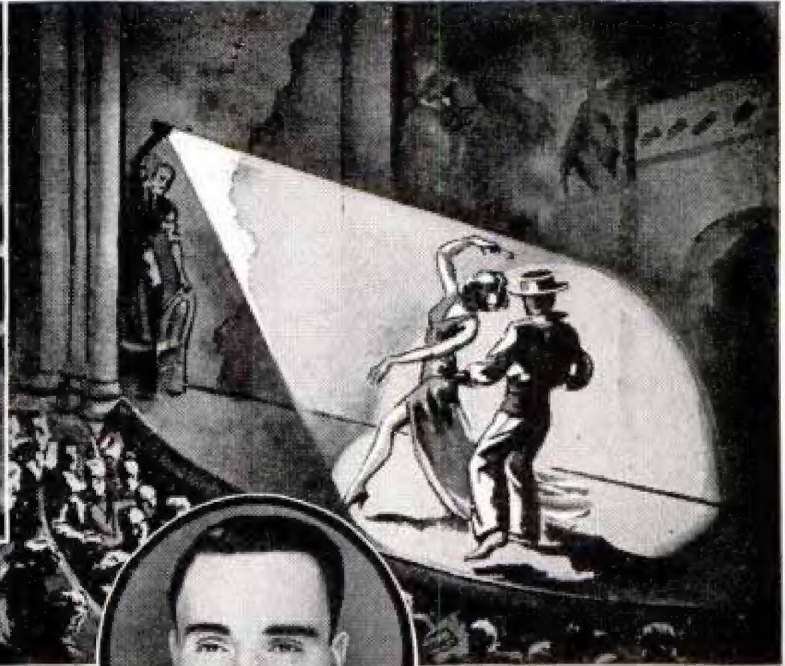


Crowded Theatre Goes Dark as Fuse Blows

"The dog-and-pony number was finishing," writes Stage Manager Frank M. Polhamius, Jr., of 195 Fuller Lane, Winnetka, Ill., "when an overloaded main fuse blew out. As the stage went black, panic threatened the lives of thousands crowding the full house.

"Part of my equipment as stage manager is my trusty 'Eveready' flashlight. Before the audience could sense that anything was wrong, I called for the curtain, dashed to the wings and played my flashlight on the apron of the stage like a baby spot.

"Fortunately, a dance team was ready to go on. In a split second they were on the stage and going through their routine in the spot furnished by my flashlight. DATED 'Eveready' batteries in that

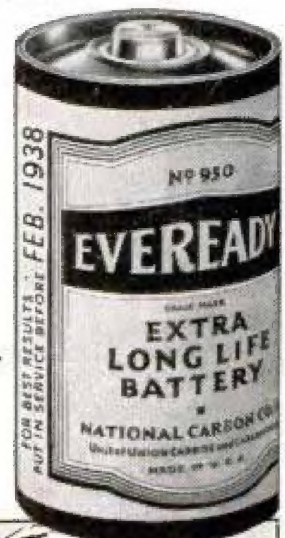


flashlight had lighted my way around dark theatres for many weeks before they

were called upon to meet this spine-chilling emergency. So you can bet I realized in those critical moments just how much it can mean to buy batteries that are *fresh* and full of life. No one can ever know how many lives were saved by DATED 'Eveready' batteries that night.

(Signed)

Frank M. Polhamius Jr.



"EVEREADY" BATTERIES ARE FRESH BATTERIES

The DATE-LINE guarantees FRESHNESS

NATIONAL CARBON CO., INC., 30 East 42nd Street, New York, N. Y.



IT SURE WAS LUCKY THOSE BATTERIES HAD THE POWER TO LAST THROUGH THAT DANCE ACT! I WANT SOME MORE OF THE SAME KIND

THAT WASN'T LUCK - THAT WAS FRESHNESS! ALL BATTERIES CONTAIN MOISTURE WHEN THEY'RE FRESH. AS THEY DRY OUT AFTER MONTHS ON THE SHELF, POWER DIES. THAT'S WHY THE "EVEREADY" DATE-LINE GUARANTEES LONG LIFE.



*ACE of
them all*

for
**Mildness
and Taste**



Chesterfield